OCT 7 1929

An All-Wave Radio Set—Page 825

25 CENTS

POPULAR MECHANICS MAGAZINE

PERIODICAL
GENERAL

WRITTEN SO YOU CAN UNDERSTAND IT

REGD. TRADE MARK GREAT BRITAIN No. 410428

REG. U.S. PAT. OFF.

SEE PAGE 714

ATKINS METAL CUTTING SAWS

Mr. Happy Man Says—

"ATKINS 'Silver Steel' to Cut Metal"

Announcing a wonderful new ATKINS "Silver Steel" Hack Saw Blade for hand use. Tests show it will cut six times as long or as much metal and twice as fast as any hack saw blade you ever used.

ATKINS "Silver Steel" Blades for metal cutting are a development you should know about and be using NOW. If your hardware dealer cannot supply them, write us and tell us what metal you are cutting, and we will see that you are supplied.

E. C. ATKINS & CO., *Est. 1857*
Dept. P, INDIANAPOLIS, IND., U. S. A.

Leading Manufacturers of Highest Grade Saws for Every Use; Saw Tools, Saw Specialties, Plastering Trowels, and Machine Knives.

ATKINS - SILVER STEEL

New Way to Learn ELECTRICITY

at Home in Spare Time

HERE'S **BIG NEWS** for men interested in Electricity. **If you are now earning less than $40 a week,** here's the **QUICKEST** way to an Electrical **Expert's** job at $60 to $125 a week. The first announcement of our new, rapid, simplified way to train you at home in spare time, with **Lessons, Job-Tickets** and **Outfits. Lessons** which take the mystery out of Electrical principles—**Job-Tickets** which apply what you learn in lessons, and give you step-by-step directions for doing actual Electrical work. **Outfits** of standard tools and materials with which you **DO THE JOB.** Read this sensational announcement. It opens the way to a better job and bigger pay.

with Lessons

1.

The Laws of Electricity made **easy to understand**—in simple language—written for the man who has had only common schooling. This training starts with the simplest principles of Electricity and progresses by easy stages until it gives you Electrical Engineering subjects, Electrical Drafting, Automotive Electricity and Radio.

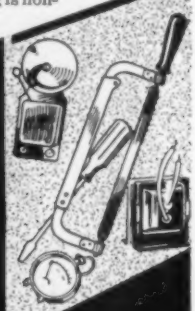
New Way to Start!

Find out if you **like** Electrical work—find out if our lessons and job-tickets are **EASY** to master. Don't take our word for it—**SEE** for yourself before you decide. **START** with the **COUPON,** below. We'll send you 5 Job-tickets absolutely **FREE**—the same material sent to new students when they pay their money and enroll—to prove that you can learn at home in your spare time—to prove this training is honest, complete, **simple.**

with Job-tickets

2.

A wonderful new system originated at the American School. After you have the **theory** from the **lessons,** we virtually send you "out on the job" with **job-tickets** and **outfits.** The job-tickets are illustrated and give one-step-at-a-time directions for doing practical work. They show which materials and tools to use and tell you **short-cuts** and **new ideas** used by **EXPERTS!**



with Outfits

This $10 Power Motor included in Outfits given to our students

3.

Seven outfits of standard tools and materials now supplied without extra charge to every student. With lessons to explain **WHY** and Job-Tickets to tell you **HOW,** this valuable equipment enables you to get a **PRACTICAL** slant on Electricity—**QUICK!** Every student is furnished these outfits.

1. **Soldering Furnace**
2. **Electric-light Wiring Equipment**
3. **Bell Wiring Equipment**
4. **Voltmeter and Compass**
5. **Transformer**
6. **Radio Receiving Set**
7. **Standard Power Motor**

Success for You in Electricity—or Your Money Refunded!

When we accept your enrollment for this wonderful home-instruction in Electricity we give you an agreement in writing that we will help you find a well-paid Electrical position within 60 days after you finish, **or every penny you have paid will be refunded.**

5 Job-tickets FREE

FREE Job Service

We can often aid students to find a beginner's job soon after enrolling.

American School Now beginning its 30th year of service. Chartered as an **Educational** institution. Not one dollar in profits has ever been paid out; every cent received for tuition has been returned to our students in instruction and service. Over 200 educators, executives and engineers have prepared the instruction we offer.

American School Dept. E-874-A, Drexel Ave. and 58th St. **Chicago**

Send no Money!

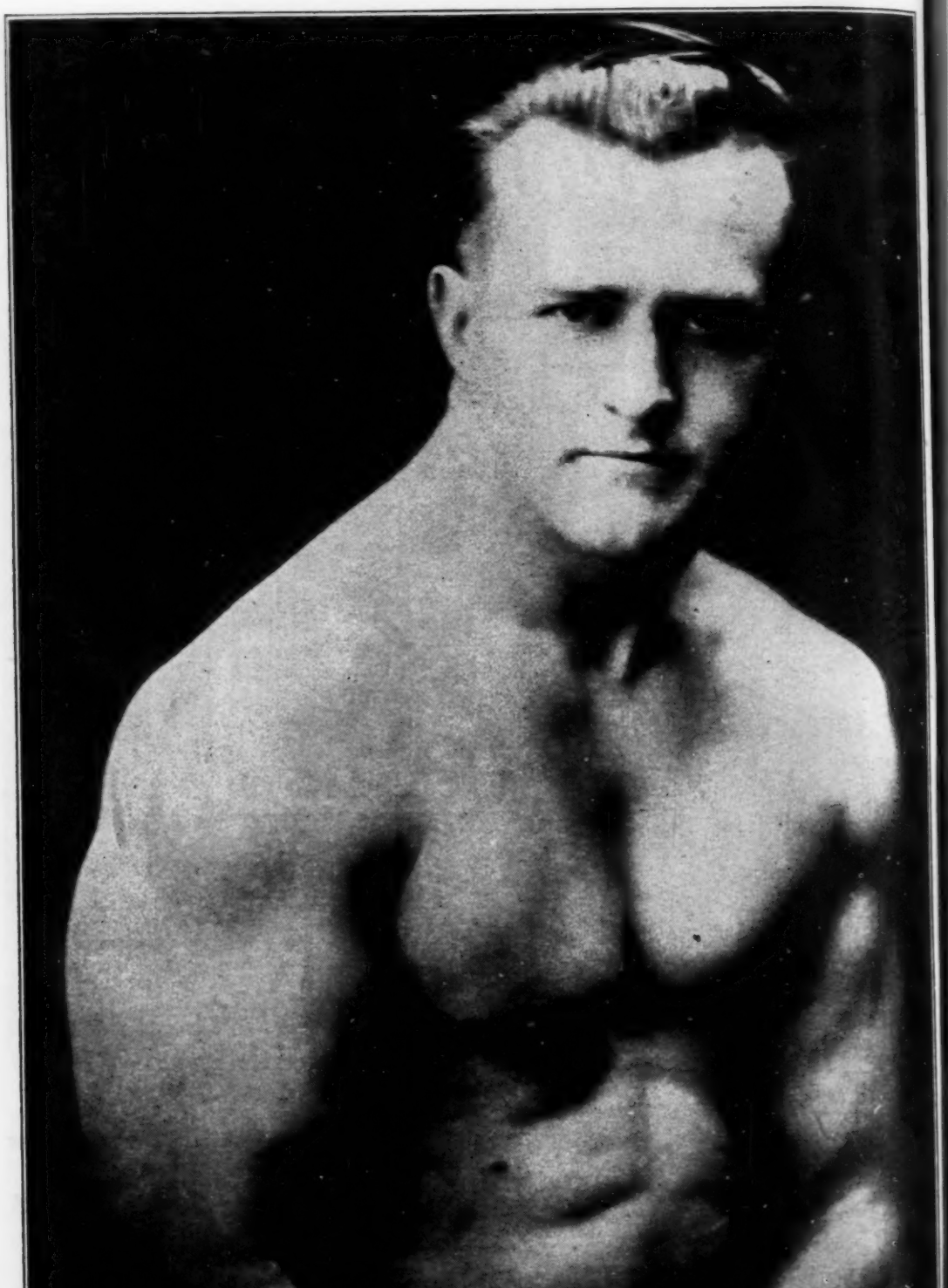
Chief Engineer DUNLAP
Electrical Division, American School,
Dept. E-874-A, Drexel Ave. & 58th St., Chicago

Send me, please, 5 Job-Tickets, absolutely Free, and facts about the great Electrical business.

Name.....

Street No.....

City.....State.....



EARLE E. LIEDERMAN, *The Muscle Builder*
Author of "Science of Wrestling," "Muscle Building," "Secrets of Strength," "Here's Health," "Endurance," etc.

Here's the most economical "B" battery ever built for radio

IN THE production of Heavy-Duty radio "B" batteries Eveready has established a new standard of economy.

Eveready Heavy-Duty 45-volt "B" Batteries will outlast any Light-Duty 45-volt "B" two to one regardless of the number and kind of tubes used! Moreover, though lasting twice as long, they cost only one-third more!

To cap the climax of "B" battery economy, in Eveready Layerbilt No. 486, Eveready has perfected a Heavy-Duty "B" battery of unequaled endurance and dependability —positively the best "B" battery its price can buy.

You can make no mistake in buying Eveready Layerbilt No. 486 for *any* set using normal voltages (45 to 135 volts).

You will be buying the utmost in "B" power dependability — the greatest "B" power operating economy — D. C. (direct current) in its purest form, which insures pure tone quality.

With colder evenings at hand, radio reception is vastly improving. Equip your set now with Eveready Layerbilt No. 486, the greatest "B" battery ever built for radio.

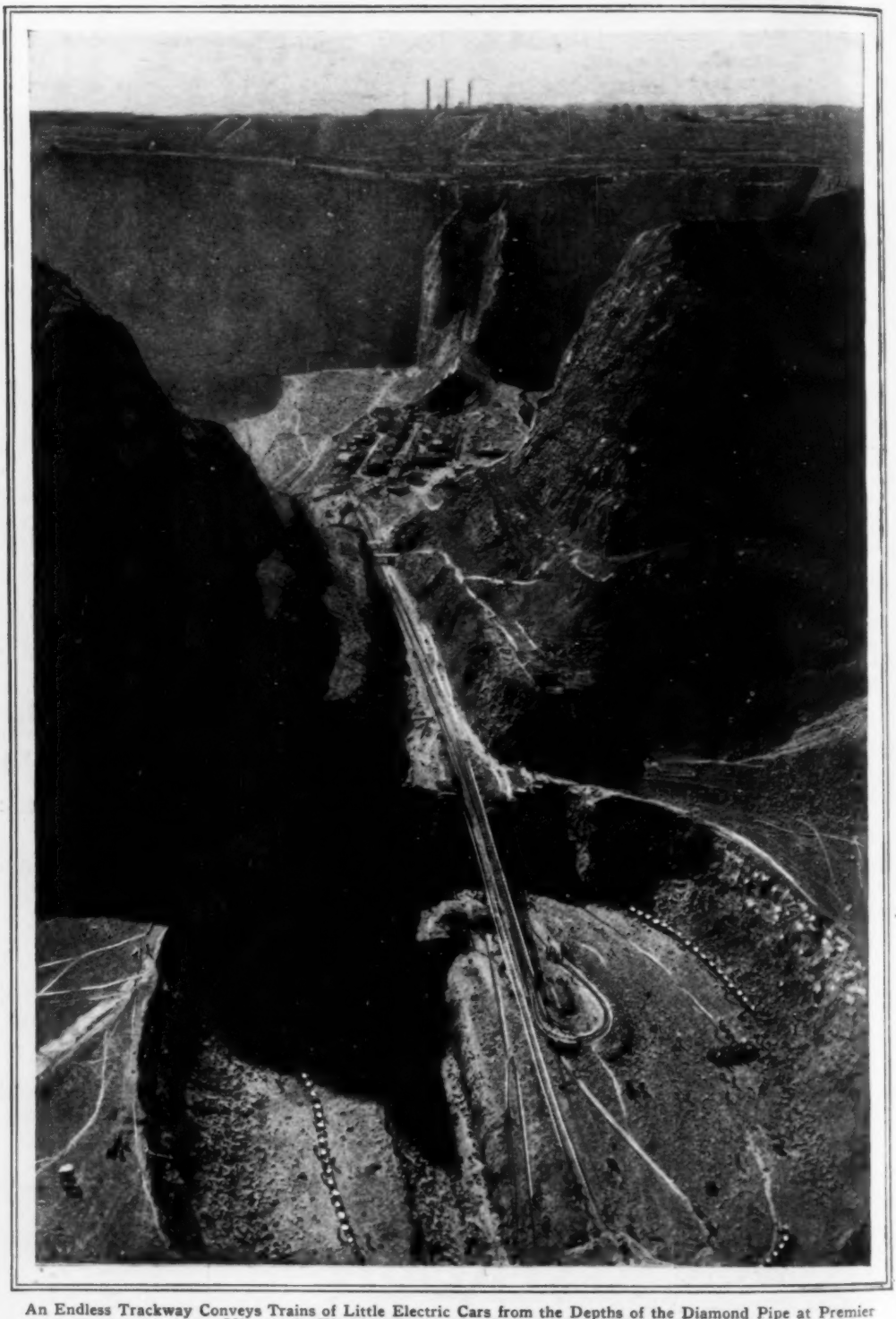
EVEREADY
Radio Batteries
-they last longer

Manufactured and guaranteed by

NATIONAL CARBON CO., Inc.
New York San Francisco
Canadian National Carbon Co., Limited
Toronto, Ontario

Tuesday night means Eveready Hour—9 P. M., Eastern Standard Time, through the following stations:

WEAF—*New York*
WJAR—*Providence*
WEEI—*Boston*
WTAG—*Worcester*
WFI—*Philadelphia*
WGR—*Buffalo*
WCAE—*Pittsburgh*
WRC—*Washington*
WSAI—*Cincinnati*
WTAM—*Cleveland*
WWJ—*Detroit*
WGN—*Chicago*
WOC—*Davenport*
WCCO { *Minneapolis* / *St. Paul*
KSD—*St. Louis*



An Endless Trackway Conveys Trains of Little Electric Cars from the Depths of the Diamond Pipe at Premier Mine to the Washing Plant in the Distance—See Page 818

Popular Mechanics Magazine
REGISTERED IN U. S. PATENT OFFICE
WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 46 NOVEMBER, 1926 No. 5

PLANE is safely landed by GIANT PARACHUTE

"PANCAKING" down from a height of 2,500 feet, an airplane equipped with a fifty-foot parachute was landed safely at a California field recently in the first test of the biggest chute yet built. Blown three miles from the field during the drop, which took sixty-six seconds, the craft landed in rough ground on a hill, damaging the undercarriage and propeller slightly. With a level landing ground, observers said, the ship could have rolled after landing and escaped damage.

The big parachute, designed by Harry D. Doucett, a chief petty officer of the navy, did not differ greatly from the smaller chutes used by flyers. It was fastened to the plane by forty feet of steel cable, and a four-point suspension at the center of balance of the ship, just forward of the pilot's cockpit. The parachute itself, folded in a container four feet long and fourteen inches square, was carried in a compartment beneath the fuselage, back of the pilot's seat. From the suspension point in front of the pilot the cable was carried along the top of the fuselage, passing over the flyer's head, around the edge of the rudder, and forward beneath the airplane to the parachute, being held in place by light twine which would break at the slightest tug.

R. Carl Oelze, a naval-reserve pilot who was picked to make the first test descent, planned to climb to a height of 5,000 feet before releasing the parachute, but because of motor trouble was forced to shut off his engine at half that distance.

"At the height of 2,500 feet," he ex-

plained after landing, "I cast a handful of newspapers into the air—a signal to my convoy of seven sister planes that I was ready to release the lever. I counted thirty, then I ducked and jerked the release. Because of air valves in the chute, it filled slowly but steadily and I was surprised and tickled to see the cable gradually rise into position without the slightest semblance of a jerk.

"One thing I had misjudged. That was the velocity of the wind, and in giving the 25,000 spectators that lined the field every possible chance I had gone too far over into the wind. This put me past one extremity of the field, and I soon saw I was going to miss. I did my best to steer for something, and made a pancake landing on a slight hill which demolished only my landing gear. 'Wings,' the parachute, settled down to ground beside me. Five minutes later the observers and spectators began swarming over the hill and the emergency ambulance dashed up to find me at a near-by house begging a glass of water from a surprised housewife."

While the parachute was being tested on the west coast, an equally important aviation development was revealed in the east when Henry Ford took occasion, on his birthday, to exhibit a new "flivver" plane developed by the Stout metal-airplane division of the Ford company. The new ship, a tiny monoplane driven by a small three-cylinder air-cooled motor is still in the experimental stage and its price and the details of its construction remain to be announced.

Model of "Wings," the Parachute That Landed a Plane Safely, and, at Left and Below, Henry Ford and His New Flivver Plane, a Tiny Monoplane Powered with an Air-Cooled Engine

Artist's Sketch Showing How the Giant Parachute Brought an Airplane Safe to Earth After the Motor Had Been Stalled; the Chute Is Made of Finest Silk, with Strong Rope for Shroud Lines, and Steel Cable to Attach It to the Ship; in Flight the Chute Folds Up in a Small Container

New Form of Metal Traffic Marker Is Easily Driven In with an Air Hammer

TRAFFIC MARKERS ARE PLACED WITH AIR COMPRESSOR

A new type of traffic marker for safety islands, or which can be used to spell out speed warnings, school-zone signs and similar information is built to last as long as the pavement itself. The marker consists of a square of heavy sheet steel, with corners bent down and buttonlike projections raised in its surface. It is driven into the pavement with a compressed-air hammer, and can be used on any type of asphalt or wood-block pavement. The markers are spaced a foot or so apart to form lines for safety zones and closer when used to form letters.

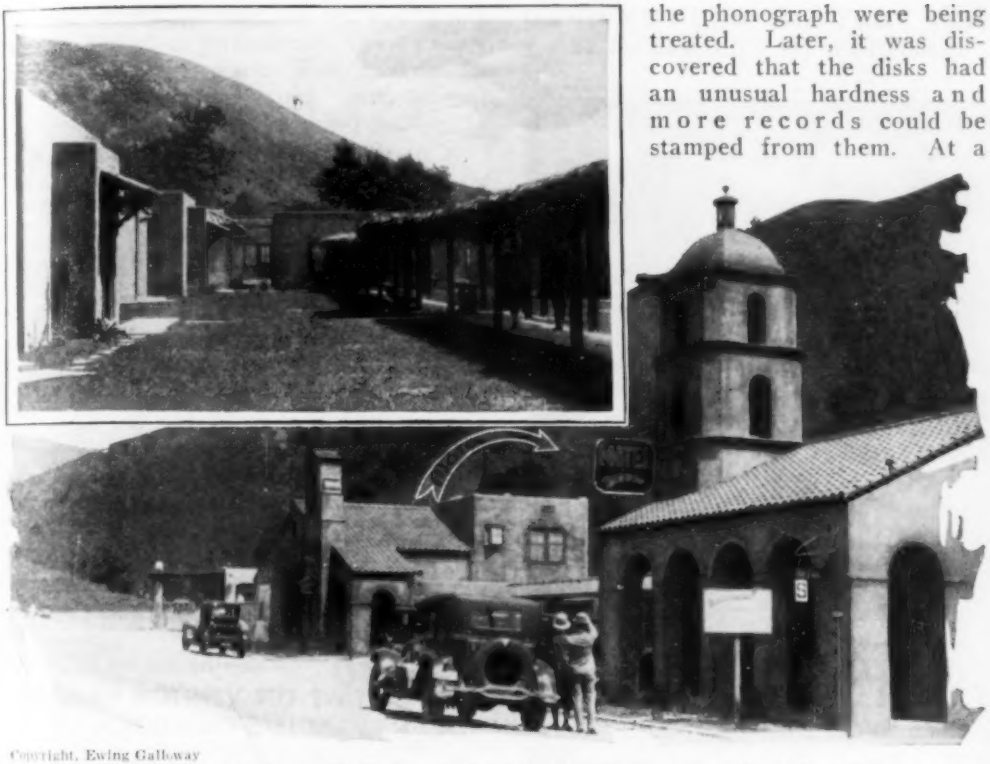
TANK LAYS SCREEN TO HIDE TROOPS IN WARFARE

An armored battle tank that shoots a smoke screen instead of bullets was tried with success recently by the Polish army in maneuvers near Warsaw. The tank resembles the ordinary military machine of the type, but instead of a gun turret carries two streamlined containers on the roof, filled with smoke-making chemicals under high pressure. In action the tank advances first and lays down a thick screen, under cover of which troops are able to advance and prepare new trenches or execute other evolutions.

FIGHTING SNOWS IN ALPS TO CLEAR AUTO ROADS

During a period of warm weather in Europe last season, there was one locality that not only escaped the heat wave but experienced some of the rigors of winter. Heavy snows fell in parts of the Swiss Alps and over the Fluela pass, drifts several feet deep being formed. It was necessary to clear the auto roads almost daily and, in places, a narrow one-way cut through the piled snow was the only means of getting in or out.

Summer Autoists in Alpine Passes Keep Cool Driving between Giant Snowbanks That Line the Road; This Is a July Scene



Copyright, Ewing Galloway

Roadside Inn on the Pacific Coast with Small Individual Bungalows Instead of the Usual Hotel Rooms for the Guests; Spanish Architecture Emulates the Old Missions

ROADSIDE INN FOR MOTORISTS HAS BUNGALOWS FOR ROOMS

Small, individual bungalows, each with private bath and garage, are the features of mission-style hotels for motorists being erected between San Francisco and Portland. The little dwellings take the place of ordinary rooms and the main building has a large dining room, office and other accommodations of the usual hotel. The bungalows face a central patio.

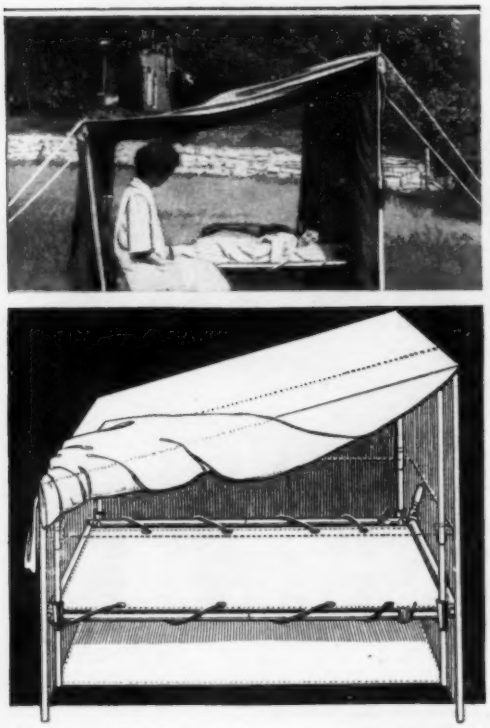
CHANCE FLIP OF BIT OF CHEESE IMPROVES PHONOGRAPH

How an Italian laborer's faulty aim with a piece of cheese made a lasting contribution to the success of his employer, a manufacturer of phonograph records, is the story told by a chemist of the bureau of standards. During luncheon time one day, the worker playfully flipped a lump of cheese at a companion. The missile fell short and landed in a tank where metallic disks used in preparing records for the phonograph were being treated. Later, it was discovered that the disks had an unusual hardness and more records could be stamped from them. At a loss to account for the change, plant officials conducted a careful inquiry to learn if the solution used with the disks had been altered in any way. The episode of the cheese came to light, and it was found that the casein the lump contained had produced the hardening of the metal.

ELECTRIC LAMP FOR MINERS DETECTS POISON GAS

Protection against fire-damp explosions is said to be afforded miners in an electric safety lamp a German engineer has devised. It operates through a series of small, semicircular loops of a special metal preparation placed in a little glass bulb which is sealed at its upper end by a porous stone. Under ordinary conditions, with the current on, the ends of the filament turn a dark-red color, indicating that the lamp is working as it should. But if there is poison gas in the air, the center of the filament becomes incandescent to a varying degree, depending on the quantity of the dangerous vapor present.

CAMP TENT AND BED COMBINED ERECTED IN TEN MINUTES



Combined Tent and Bed for the Auto Tourist; It Is Assembled or Taken Down in One Operation

For the auto tourist, tent and bed have been assembled into a single unit which is easily and quickly set up or taken down and weighs only seventy pounds. The bed frame is attached directly to the tent supports and its canvas mattress is tightened with a ratchet and may be laced so securely that it will not sag even with two persons, each weighing 200 pounds or more, it is said. The tent provides space for dressing room and has side curtains with windows.

ARCTIC GRASS FOUND IN U. S. LEFT BY GLACIERS

Grasses found flourishing recently on the peaks of Mt. Massive and Mt. Elbert, 14,400 feet above sea level in Colorado, have been identified as belonging to species found along the Alaskan coast. The only explanation for their presence in Colorado, according to Prof. A. S. Hitchcock, of the department of agriculture, who made the discovery, is that in the glacial age the ice from the north carried grass seeds southward and left them stranded in the Rockies. Prof. Hitchcock is collecting and classifying the 1,500 species of grass in the United States as part of the work of the government toward replanting the range lands in the west and controlling grazing.

NEW HARD STEEL TO LOWER COST OF MACHINERY

A new hard steel, which can be produced at less cost than present alloys, recently was developed by a steel mill in the Pittsburgh district and given the name of "jalcose." Its surface is extremely hard while the interior is tough but ductile, making it suitable for automobile and machinery parts where there is severe wear, repeated shocks or great stresses. Because of the comparative softness of the interior it can be machined more easily than pure hard steel.

MOTORBOAT ON VENICE CANALS REPLACING GONDOLA

Travel on Venice canals has been made more rapid lately by the use of small motorboats to supplement the traditional gondola. Some of the leading hotels have their own craft to take guests to and from

Taxicab Meters and Flags Are Used on Motorboats That Ply the Canals in Venice

stations and for rides about the city, and there are stands where the boats may be hired like taxicabs.

RAIN AND SNOW FERTILIZE SOIL

That rain and snow do more than water the soil has been confirmed by Canadian chemists, who for several years have been measuring the nitrates absorbed from the air and brought to earth by them. They found that in the region around Ottawa the fertilizer washed into the earth out of the air was equivalent to forty-four pounds of expensive Chilean saltpeter per acre each year. Dr. Frank T. Shutt, Dominion chemist in charge of the experiments over a period of seventeen years, also spoke a good word for the much maligned soft coal. Ammonium nitrate, the form in which the fertilizer comes from the air, is given off by soft-coal fires in large quantities. Increase in the use of the coal is marked by corresponding increase in fertilizer. Forest and brush fires and lightning discharges also help increase the ammonia content of the air.

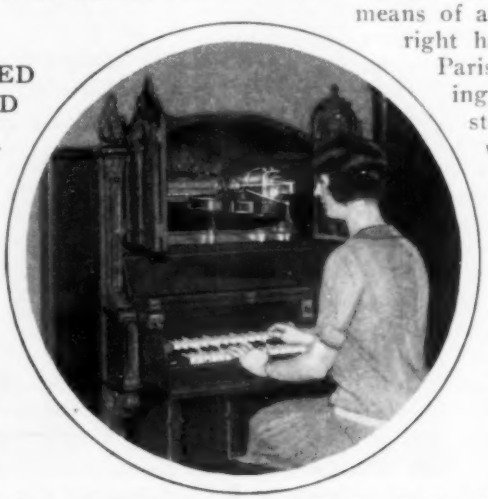
The Side Wheels of This Motorcycle Are Drawn Out of the Way When Traveling, While Providing Safety on Sharp Turns

SIDE WHEELS ON MOTORCYCLE AID IN TURNS AND STOPS

A two-seat motorcycle with small side wheels that can be raised or lowered by means of a lever at the driver's right hand, has appeared in Paris. The extra pair resting on the pavement helps steady the machine when it is stopped, and reduces the danger of accidents on sharp turns. The comfort of the passenger in the rear seat is also increased as the cycle cannot lean excessively.

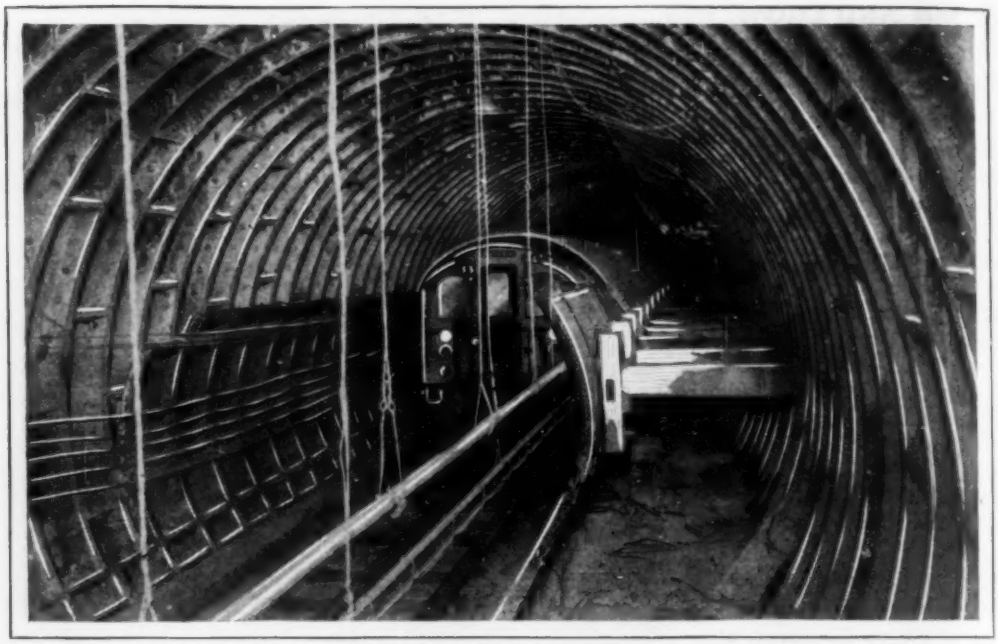
VIOLIN IS PLAYED WITH KEYBOARD

Inclosed in a decorative cabinet, a violin is played with a keyboard similar to that of a piano. It is said that tremolo effects can be produced by merely pressing and releasing the right key, and several instruments may be combined and played together, either with the keys or by means of rolls.



With a Piano Keyboard, This Violin Can Be Played without Learning to Use a Bow

¶ During the past year, 524 more ships passed through the Panama canal than in 1925.



Difficult Engineering Feat in London Nearing the Close; after Building a Large Subway Tunnel around a Smaller One, the Workmen Begin Dismantling the Latter While It Is in Use

TUNNEL DUG AROUND TUNNEL WITHOUT HALTING TRAFFIC

That engineers can accomplish the seemingly impossible has again been demonstrated in a subway alteration in London. The problem was to construct a siding between two tunnels on different levels without interfering with the trains that whizzed by every two or three minutes. There was a difference of ten feet in the levels, the space between was narrow and the ground contained pockets of water-bearing sand. Furthermore, junction tunnels had to be made to connect the siding with the running tunnels. Most of the siding, except about 320 feet of lead-in section to the down-running tunnel, was bored by hand at practically the same level as the higher of the two passages along which the siding ran 720 feet. Air locks and compressed air were used to hold back the water in the sand pockets. While the junction tunnel was being constructed, the running passage was literally a tube, supported at the base and sides with timber struts to prevent collapse as the earth was removed from around it. The workers thus literally dug a tunnel around a tunnel without stopping traffic in the inner one. To keep the compressed air from entering the inside tube, the holes in the segments through which cement had been injected when the tunnel was constructed, were plugged up. When the outer passage was completed, the sides of the inner one were dismantled and the props that had supported them were left imbedded in the concrete in which the tracks for the new bore were laid.

AUTO MAP ON STEERING POST READ AT A GLANCE

Intended primarily as a certificate-holder, a metal frame for an auto road map is fastened to the steering column just under the wheel so that the guide may be seen at a glance while driving. A celluloid cover protects the map from the weather.

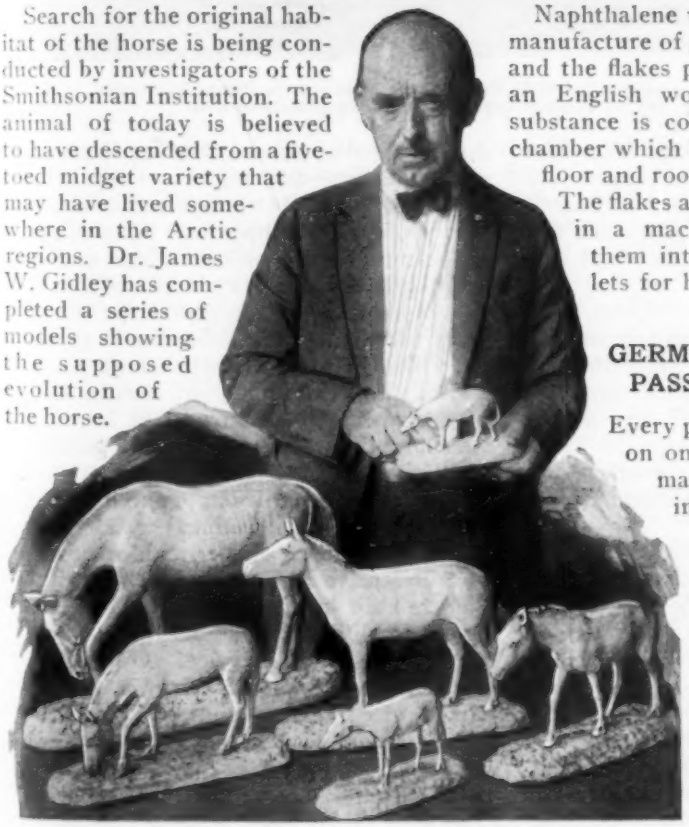
Chimpanzees are about four times as strong as a man, weight for weight.

GUN SNAPS A PHOTO OF THUG AS IT SHOOTS

A camera pistol that automatically takes a picture of the person or object at which it is fired has been invented by a mechanical engineer, who claims that, by the addition of magnesium flash powder to the ordinary charge, the revolver can even keep its photographic record at night. With it, he says, the picture record would identify a criminal even if the bullet missed him, while it would also be a positive record in self-defense cases, as the photo would show what the other person was doing when he was shot at. His idea is that the camera case should remain locked, with the key in possession of the police department, which would develop the films and hold the record.

STORY OF HORSE'S EVOLUTION TOLD IN MODELS

Search for the original habitat of the horse is being conducted by investigators of the Smithsonian Institution. The animal of today is believed to have descended from a five-toed midget variety that may have lived somewhere in the Arctic regions. Dr. James W. Gidley has completed a series of models showing the supposed evolution of the horse.



Dr. Gidley with Models That Tell the Story of the Horse's Development from Early Ancestors; Scientists Are Seeking Animal's Origin

Moth Balls Falling from the Press into Basket for Packing; They Are a By-Product in Gas Making

CONDENSED GAS FROM COAL MADE INTO MOTH BALLS

Naphthalene vapor, a by-product in the manufacture of gas from coal, is condensed and the flakes pressed into moth balls at an English works near London. The substance is collected in a condensation chamber which becomes covered on walls, floor and roof with the solidified vapor. The flakes are shoveled up and pressed in a machine which quickly rolls them into the familiar round pellets for home use.

GERMAN AIR LINES INSURE PASSENGERS IN PLANES

Every passenger who buys a ticket on one of the seventy-five German air lines is automatically insured for $6,000 under a new ticket system put in effect recently. The insurance company which handles the policy decided that flying in Germany was as safe as riding on a train, and charged merely the normal accident rate, instead of the extra-hazardous-occupation rate. No passenger was injured on German lines in the first half of 1926.

From Clipper Ship

"Flying Cloud," One of the Most Famous of Donald McKay's Clipper Ships and the Fastest Sailing Ship under the American Flag, and, on Opposite Page, the Latest Diesel-Motored Liner

SEVENTY-ONE years ago the first mate of the Boston-built clipper ship "Lightning" closed his log entry for March 1, 1885, with these words: "Distance run in twenty-four hours, four hundred and thirty-six miles."

That was a record that still stands. No sailing ship had ever sailed so fast and far in a single day, and it is improbable that one ever will. But the tramp steamers had already begun to chug their way across the seas and the clipper ship, the most beautiful thing seafaring men ever invented, was already doomed, though but a half dozen years old.

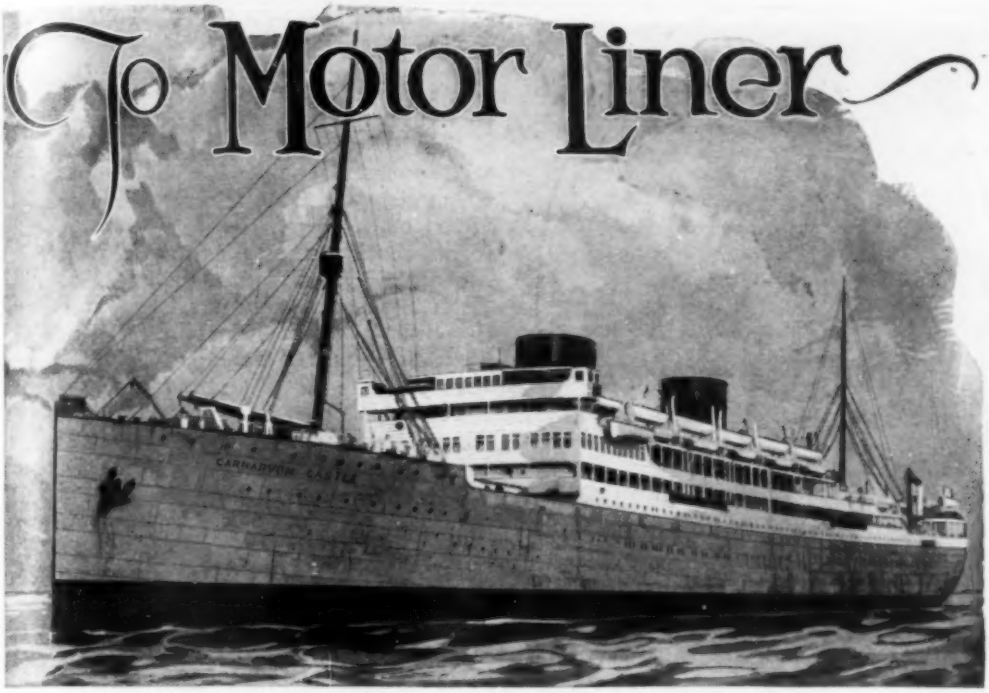
Today the steamers that drove the sails from the ocean are fighting another, and a losing battle, against man's latest development, the motor ship. Like the steamer that displaced the clipper, it costs more to build than the losing boat, but it is cheaper to operate and can carry the world's freight at lower rates.

The clipper was born in the mad rush to get to the gold fields of California. Passengers paid enormous fares and the freight rates were gigantic. Under such conditions the long, narrow hulls, with their somewhat limited cargo space, could pay dividends—and big ones—but when the world settled down to five and six-per-cent profits, the clipper was doomed.

The motor ship, with its Diesel engines burning heavy oil, has placed millions of tons of shipping on the seas in the last six years for the same reason—surer profits.

To Donald McKay, who came to the United States as a boy of sixteen from Nova Scotia, America owes the honor of sweeping the seas in the most glorious days of sailing ships. He built the fastest clippers that ever sailed; not one, but many of them. The "Lightning," which made her world's record on her maiden voyage from Boston to Liverpool, was one of four clippers built by McKay at the same time for a British line which had ordered them for the Australian service. One of the quartet, the "Donald McKay," only ship named after their designer, logged 421 miles on her maiden voyage that same spring. Another, the "James Baines," sailed around the world, Liverpool to Liverpool in 132 days, a record no other sailing ship ever equaled. The four were built after James Baines, the president of

To Motor Liner



the line, had leased McKay's "Sovereign of the Seas"—one of the finest ships that ever flew the American flag—and offered space in her hold at seven pounds per ton, the shipper to recover two pounds if she didn't beat every steamer on the run to Australia. Baines kept the money.

What the speed of these fast clippers meant is better understood when it is realized that no steamer afloat at the time could have come within a hundred miles of "Lightning's" 436-mile log for twenty-four hours—in fact, there are hardly fifty great passenger liners afloat today that can better that mark. In her log for that first of March the first mate wrote, "Strong gales, bore away for the North channel [they were then 500 miles off the Irish coast], carried away the foretopsail and lost jib; hove the log several times and found the ship going through the water at the rate of eighteen to eighteen and one-half knots; lee rail under water and rigging slack."

Her sister ship, the "James Baines," was as fast, though she never logged quite so many miles in a day, but on one occasion she attained a speed of twenty-one miles an hour—a marvelous performance for a craft borne by the wind.

McKay did not create the clipper ship, but he did bring it to perfection, and built the greatest clippers that ever sailed. Before his day, sailing ships were small and broad and short, with bluff bows hammering their way through the water, and squat, square sterns—a cod's head and a mackerel tail was the shipbuilder's model. McKay's clippers were just the reverse, long and narrow, lean as a racing greyhound, with both bow and stern concave at the water line—the same flaring lines used for the racing cruisers and battleships of today.

Above the deck towered lofty masts and giant spars, carrying a vast spread of canvas. The "Great Republic," of 4,555 tons, biggest of them all, had a main yard 180 feet long and her suit of sails consumed 15,000 square yards. She inspired Longfellow's poem "The Building of the Ship."

She was doomed, though, never to set them, for while she was loading at a New York pier for her maiden trip, after having been towed down from Boston, a waterfront fire spread to her sails and the ship was so badly damaged it was necessary to scuttle her to put out the flames. Raised again, she was cut down to 3,357 tons, with corresponding decrease in her

Donald McKay, the Nova Scotian Boy Who Made the Stars and Stripes Supreme on the Seas

sail area. In spite of the cutting down, she made a voyage to San Francisco, around the Horn, in ninety-two days—only three days slower than the record. What she might have made as originally designed can only be conjectured.

It was a McKay ship, the "Flying Cloud," that set the world's record for the passage from New York to San Francisco. On her maiden voyage in the summer of 1851, carrying a cargo of gold seekers bound to the coast, she made the voyage in eighty-nine days, a record that was only equaled twice, by herself in 1854 and by the "Andrew Jackson" in 1860. On that memorable maiden trip she raced the notorious "Bully" Waterman's "Comet" and beat it by nineteen days.

The "Flying Cloud" was not a big ship, as later clippers went. She measured 229 feet long on deck, with a breadth of forty feet eight inches, and had a registered tonnage of 1,783. Beneath her bowsprit a beautifully carved figurehead showed a winged angel blowing a trumpet.

In a day when ship owners had already begun naming their vessels after themselves and members of their families, McKay's clippers not only were famous for their beauty and speed, but for the aptness with which he named them, when wise owners permitted him to do this. From his yards came "Westward Ho" and "Star of Empire," both for the California service; the "Staghound," "Ocean Monarch," "Sovereign of the Seas," "Bald Eagle," "Chariot of Fame," "Empress of the Seas," "Great Republic," "Romance of the Seas," "Defender," "Mastiff," "Glory of the Seas," and many others.

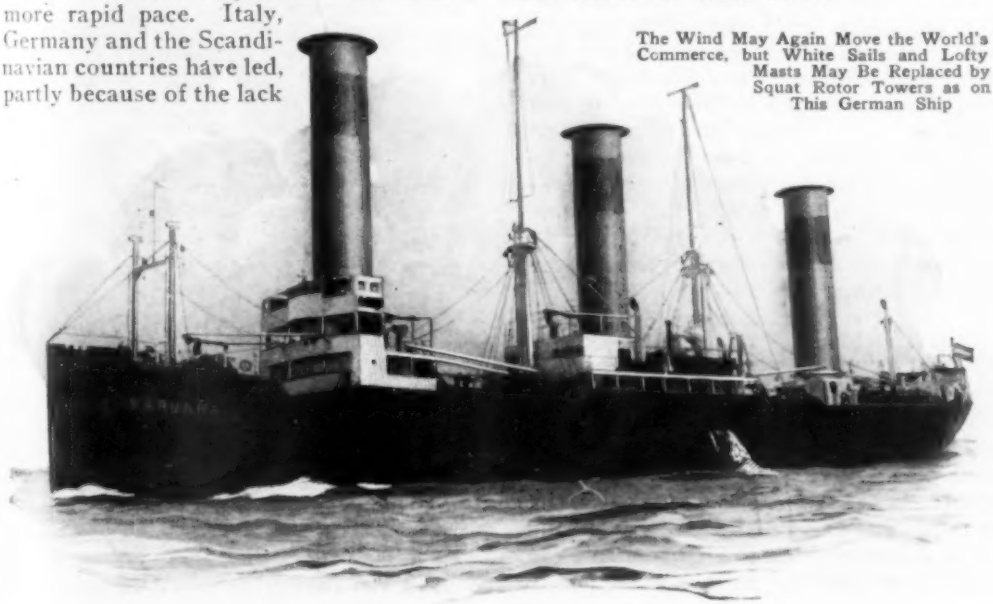
Yet the first of his great clippers, the "Staghound," was not launched until December, 1850, and the last real clipper, "Donald McKay," slipped down the ways in 1855. Into those five years a whole revolution in naval architecture was crowded. The four Australian packet ships, including "Lightning" and her three sisters, closed the era of extreme clippers. McKay continued to build medium clippers, broader of beam and with smaller masts and sails, until the Civil war turned him into a gunboat constructor of the navy. After the war he turned out three more medium clippers in 1868 and 1869, but already the market for the wooden hulls to be sailed by iron men was passing.

The change from sail to steam was fairly gradual. The clippers went within a few years in favor of slower ships with greater

Model of "Lightning," a McKay Clipper That Holds the Record as the Fastest Ship That Ever Sailed

A Long Way from the Stately Masts and Billowing Canvas of Clipper Days; This Is the "Leviathan," Queen of the American Merchant Fleet, Leaving New York at Night

freight capacity, or else had their masts and sail area cut down to make them more economical in operation—as happened to the famous "Cutty Sark"—but it took forty years or more for steamers to really supplant the wind. The new shift, from steam to motor ships, has started at a more rapid pace. Italy, Germany and the Scandinavian countries have led, partly because of the lack of good and cheap coal, while the change has been much slower in England. The British, however, have built several notable motor vessels, one a big passenger ship that runs between western Canada and Australia, and two others for the England-South American trade.



The Wind May Again Move the World's Commerce, but White Sails and Lofty Masts May Be Replaced by Squat Rotor Towers as on This German Ship

Ordinary Rear-View Mirror, and Below, Glareproof Glass That Keeps Dazzle Out of Eyes

GLAREPROOF MIRROR FOR AUTO MAKES NIGHT DRIVING SAFE

To eliminate some of the dangers of night driving a glareproof, rear-view mirror has been developed. The backing, which is prepared by a secret process, does away with sun, snow and headlight glare, and increases the mirror's effectiveness for daytime use. Images are sharp, clear, and well defined, as in a camera finder. The objects seen are in their proper colors, and appear at their actual distances. This last feature is particularly valuable, as it permits a driver to gauge accurately how far behind cars are.

SCHOOL FOR DOCTORS ON TRAIN GIVES HOSPITAL POINTERS

What would a surgeon do if the lights were suddenly extinguished while he was working on a patient in the operating room? When is an "ashes of roses" color best suited to the walls of a sick room and when is orange most effective? How can a physician tactfully induce a mother to quiet her children who may be laughing and shouting in a sick ward, disturbing the patients, and yet not lose the woman's good will? These and other problems relating to hospital management and procedure were studied on a train carrying delegates to the American hospital convention at Atlantic City. The classes were composed of doctors from various parts of the country, and experts in that particular field of medical work were obtained to give the instruction. The plan not only proved a satisfactory employment of spare time, but the questions and studies were related to matters discussed at the convention and subsequent hospital visits.

ONE-MAN "SODA FOUNTAIN" WALKS BELGIAN STREETS

In Belgian cities, the version of an American soda fountain is the cocoa vender, who tours the streets and serves his customers in the open. The cocoa peddlers carry a pair of tanks slung to their backs, one filled with cocoa and the other with water, the latter for rinsing the glasses, of which each vender has two, the limit of customers he can serve at one time. The faucets of the two tanks are carried around under his arm to a convenient position.

Belgian One-Man Soda Fountain That Carries the Drink Direct to the Customer on the Street

TINY FIREBOAT PROTECTS SUMMER-RESORT HOMES

The problem of securing fire protection around lake resorts seems to have been efficiently and economically solved by a small fireboat recently developed by a westerner. The boat has enabled its builder and owner to establish himself in a business in which he earns a substantial sum during a season of four months. Lake resorts where people have summer

One of the World's Smallest Fireboats Is an Outboard-Engined Skiff Maintained for Summer Residents at a Western Lake; the Motor Pump Can Be Carried Ashore to Fight Forest Fires

homes and cabins are usually situated in forested country. Such locations seldom have adequate fire-fighting equipment. Consequently, during seasons of scanty rainfall, the fire risk is great and full fire insurance prohibitively priced. This condition is particularly true in southern California where the summer months are virtually rainless. The danger from fire at such resorts, as observed by Frank Lewis, of Los Angeles, set him thinking of ways by which the large property investments around the lakes might be protected. The fireboat shown in the accompanying illustrations is the result. And, in conjunction with it, he has developed a novel business plan whereby the owners whose property he protects pay on a monthly subscription basis. The boat is only sixteen feet in length, and driven by a two-horsepower outboard motor. In this hull was installed a high-pressure fire pump, with a fifteen-foot length of suction hose, and 1,000 feet of two and one-half-inch fire hose. The pumping unit weighs a little over 100 pounds and the fire hose only a few ounces per foot, so that the total load carried in the boat is by no means excessive. The boat can speed around the lake at from six to eight miles an hour, and can throw water on any fire originating within 1,000 feet of the shore. Each owner pays for fire protection on the basis of $1 on each $1,000 valuation of the property. While this rate is cheap for the owners, it nets the fireboat man an easily earned addition to his income from fishing, which is his regular occupation.

An Unusual Feat in Animal Training, Breaking a Team of Zebras to Pull a Cart

HARNESS-BROKEN ZEBRA TEAM SHOWS TRAINER'S SKILL

Few animal trainers have been able to teach zebras tricks because of the vicious disposition of the animals and their unreliability, but a policeman in Golden Gate park, San Francisco, has tamed a pair until he can drive them as a team harnessed to a light rig. The beasts are owned by the park and attract considerable attention as they canter along the roadways.

RELICS OF MAKE-BELIEVE LAND REFLECT STAGE HISTORY

In a large building on one of New York's busiest streets is housed one of the most romantic museums to be found anywhere. It is the storage place for the properties of some 800 theater productions. Rusted poniards and masks, dusty furniture, modeled carefully in historic styles, costumes, gilded odds and ends and even an assortment of imitation bathtubs are collected here, evidences of past glories before the footlights and proof of the amazing ingenuity and skill required to entertain the public. A portion of a locomotive set, one of the high lights in a famous production, models of yachts, collections of guns, Roman chariots, busts of noted persons, and replicas of art objects are included in this historic array. As a reference source, the collection is considered valuable, as many of the chairs and tables, for instance, were exactingly copied from originals and strange customs and fashions of departed days are reflected in various articles. Dampness-proof things are kept in the cellar.

TANK ON REGISTER KEEPS PROPER HUMIDITY

To insure the proper humidity of room interiors, a water shield for hot-air wall registers has been found practical. Besides keeping the air moist, it deflects the heated current toward the floor, thereby aiding in maintaining an even temperature. A screen collects dirt to protect the walls and drapes. Less heat is required when the air is sufficiently humid so that a saving in fuel can be effected with these shields.

Water Chamber Built to Fit over Hot-Air Register to Maintain the Correct Humidity

Health is promoted as dry air tends to decrease the moisture in the breathing passages, exposing them to infection. The attachments are made of oxidized copper, held by adjustable wire hooks and can be put on or removed without the use of tools.

When the Guns of the "Nevada" Were Fired over the Bow, the Force of the Fire Caused the Vessel to Plunge like a Great Whale; to the Amazement of Officers, Little Damage Was Done

BATTLESHIP FIRES DEAD AHEAD BREAKING NAVAL CUSTOM

Shattering a naval precedent held in all the great fleets of the world, the U. S. battleship "Nevada," in practice not long ago, fired her main batteries dead ahead. When the shock had subsided and the ship brought to, it was discovered that, beyond broken porthole glass and slightly strained minor bulkheads, the vessel, one of the oldest dreadnaughts in the navy, had sustained the terrific test without any damage which would have prevented continuing in battle. The big guns are not fired dead over the bow or stern because there is no path of recoil for the explosions. The ship must absorb the recoil within itself. Vessels may fire to port or starboard because the ship veers far over to the side opposite the firing. This roll of the vessel absorbs the recoil energy. In this lies the primary reason why modern fleets attempt to "T" the enemy line when they move their line at right angles across the antagonist's fleet. Shortly before the "Nevada" began the test, all hands among the turret crews were informed of what was to happen. A few points were fired from the starboard bow, the reaction shaking the ship violently. The next shot went directly over the bow. The "Nevada" lurched and buried her bow in the water rising like a great whale, then recovered.

Siren and How It Is Attached to the Plane; It Shrieks a Two-Toned Warning as Craft Descends

TWO-TONE AIRPLANE SIREN AIDS IN LANDING

As a warning when landing at night and to attract attention when the craft is used for advertising purposes, a siren that produces two tones and is driven by air, has proved effective. It can be heard at a considerable distance even above the roar of the propellers, according to reports, and is easy to attach or remove.

¶ The eyes of a fly are as rigid as jewels in a watch.

The ROMANCE of the

Eskimo Hunter Keeping Watch at a Seal's Blow Hole

THAT civilization may have furs of amazing fineness, the crews of the polar fleet yearly face the hazards of the vast ice and snow wilderness of the Arctic regions for months on end. Desolation and monotony are everywhere and possible death stalks beside them as they travel through uncharted channels or cross treacherous ice packs in quest of those animals which wear pelts so prized by Dame Fashion.

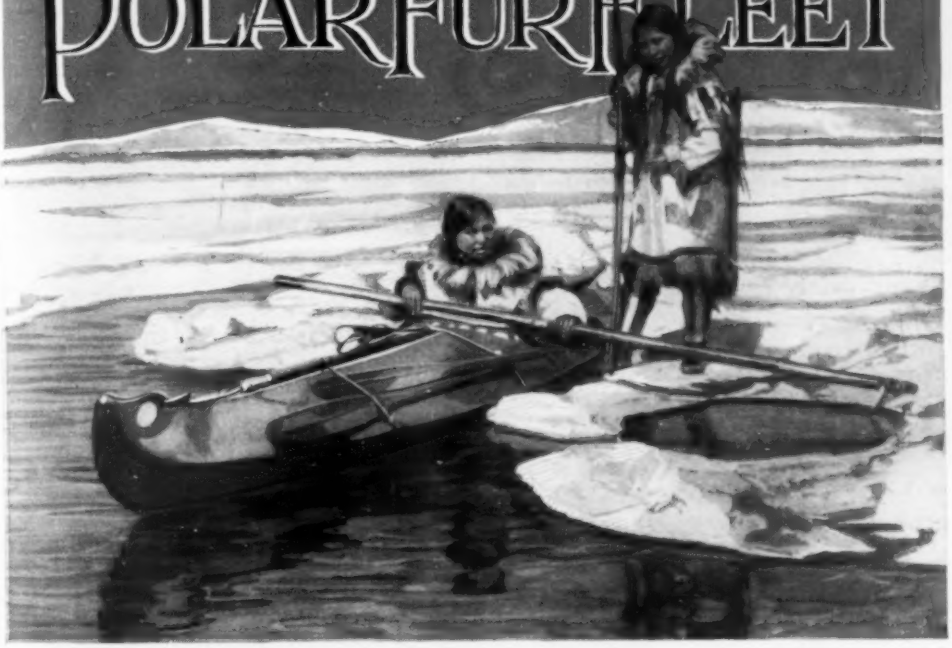
While polar expeditions, using the latest scientific and mechanical means of transportation and communication, have penetrated the vast icy hinterland to the heart in search for new lands gripped by the big ice pack, the fur fleets have been putting forth greater efforts than ever to gather the rich harvest of furs known only to the Arctic, and by their persistent penetration have lifted much of the veil of mystery from these desolate and remote regions.

This is especially true of the Canadian Arctic, where fur-fleet vessels now cruise far along the northwest passage, in search of which the famous Franklin expedition of 1845 perished. Though Amundsen's expedition of 1903-06 was the only one to travel all the way through this treacherous passage from Atlantic to Pacific, yet other vessels have penetrated deeply and returned with a cargo of furs worth a king's ransom. The polar fur fleet has recently pushed its way from Alaska to King William's land and Bathurst inlet, making conquests of passages which a generation ago would have been considered a credit to any polar explorer, but which the masters of these schooners look upon as but a part of the day's toil. They make a profitable round trip along these subpolar coasts in the short summer season when the ice is moving, permitting small vessels, rigidly built, to make the passage successfully. Here are found some of the world's richest peltries, since this is the home of the rare seal, the rarer white fox, and that rarest of all "water-babies," the sea otter.

Herschel island, a noted whaling base in days gone by, is the principal port in the western Arctic, and here new activities have been taking place in the race for faraway peltries in recent times, under the lash of the popular demand for these rare furs. Recently six new auxiliary schooners and steamers were making their slow way through Bering strait, ready to call at Herschel just as soon as the ice loosened. Those rich peltries of the eastern Arctic region, Hudson bay and Baffin land, are reached by Atlantic schooners leaving Montreal and Halifax early in the summer, returning before the ice seals the waters for the long winter.

In the first few days of March, following a practice that has prevailed for some 200 years, the Newfoundland sealing fleet leaves the port of St. Johns for the Banks

POLAR FUR FLEET



on its annual expedition into the Arctic. Some ten or a dozen vessels set forth on this romantic and, at times, hazardous expedition; and what a thrill must face these "swatchers for swills," as they call themselves, as they gaze across vast ice floes dotted with "white coats" as far as the eye can see, which testify to the assertion that the famous seal herds off the Newfoundland and Labrador coasts are on the increase even in face of the growing demands of civilization.

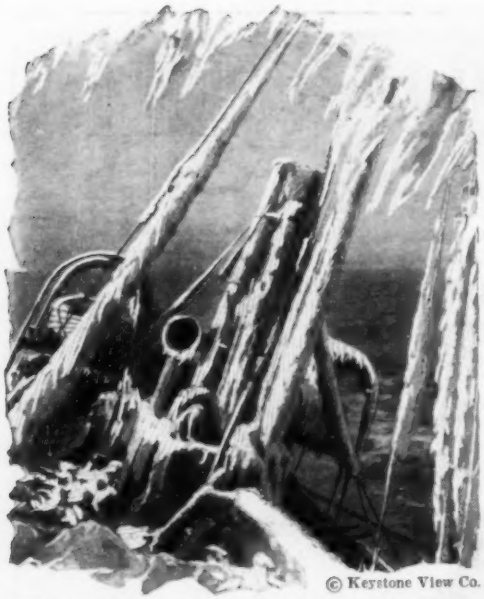
The sealing industry, exploiting the rich resource lying off the coasts of the island, is one of the most ancient of the economic activities of Newfoundland. It was started in 1763, when the first expedition ventured forth.

Although arctic fur schooners, because of the hazards of polar ice floes, are of necessity small, the vessels engaged in the sealing industry have been considerably modernized. The sailing vessels became larger year by year until they were almost entirely superseded by fast steamers, which facilitate the methods of the seal hunt. Now, though there are a few sailing vessels in the expedition, the steamer is the most important factor and accounts for four-fifths of the catch.

In recent times, the annual seal expedition has been further brought up to date by the use of the aeroplane and radio. In olden times the seal herds were located by men in the rigging of the sailing schooners with a limited range of vision. The plane now does this "spotting" for the entire fleet and short-wave transmitters broadcast the exact location and probable number of animals in the various herds.

One of the common sights in the polar regions is a ship in the grip of the great ice pack. Deserted schooners are found often by the fur fleet crews "hove-out," or thrown on their beam ends, clear out of the water, because solid ice has formed under them. Or, the polar schooner may be caught in a moving channel of ice and crushed to pieces, forcing her crew to take to large ice cakes, leaving them stranded many miles from assistance and facing starvation.

When the polar schooner becomes "stranded" or "jammed" in large ice floes and is frozen in, if the crew toil persistently day and night, they may save their



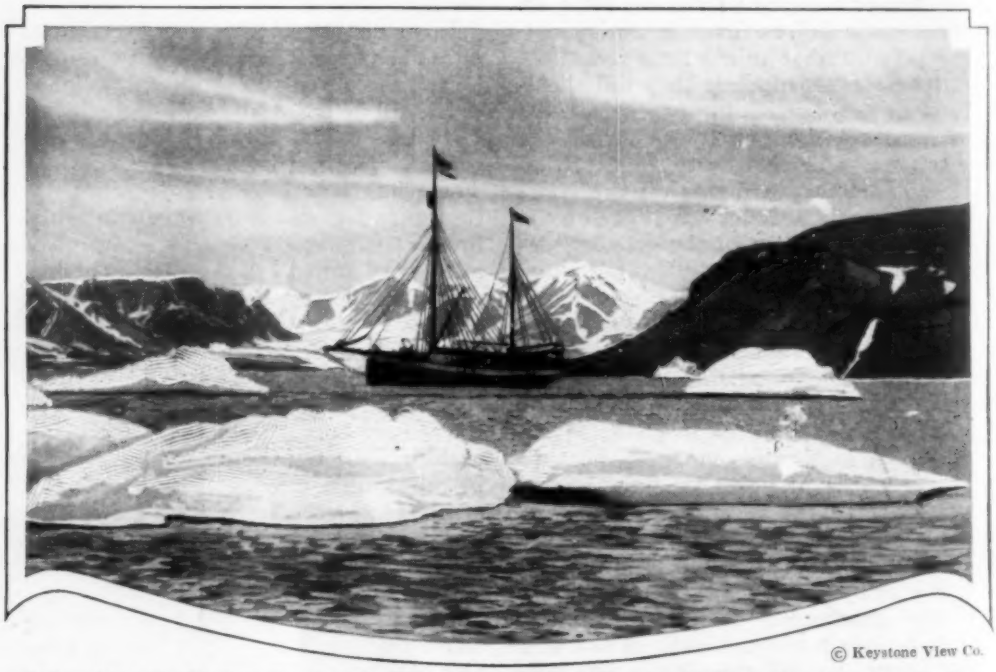
© Keystone View Co.

With Rigging Shrouded in Ice the Vessels Must Battle Constantly to Overcome the Effects of the Cold

ship and their lives. Then it is that they cut a channel to the open water from the "standing edge," or from the edge of the permanent ice that lies all winter in protected spots. They chip and bore with chisels and pike poles, and saw ice into large blocks, which are forced under the ice field until a channel is made to open water.

Arctic travel is still a hard problem even with the present rapid advance in methods of polar exploration, including the use of airplanes, dirigibles, snow motors and other devices up to date or even dated a little ahead, with which arctic expeditions are now equipped. Capt. Roald Amundsen's late schooner "Maud" still compels admiration for her stanch resistance to the buffeting seas and grinding ice packs. Now known as the "Baymaud," the old "Maud" is a part of the famous fur fleet of the Hudson's Bay company, and is used in the western arctic trade.

The "Friendly Arctic," as Stefansson terms it, has proved none too kind to the Hudson's Bay fleet, for their schooner "Lady Kindersly" was nipped in the ice pack near Point Barrow, and had to be abandoned with all her valuable cargo of supplies and trade goods for posts from Herschel island eastward. A year later the "Bayeskimo," operated in the eastern arctic, was caught in the ice of Hudson strait and lost with her cargo while on her



© Keystone View Co.

Icebound in a Far Northern Bay, the Ship Waits for the Floating Bergs and Fields to Move Out of the Harbor Entrance; There Is Constant Danger of Being Crushed by the Ice

way to Hudson bay, and the crew rescued from an ice floe on which they at last had taken refuge.

The large fur companies are not alone in considering the polar regions their happy hunting grounds, although the Hudson's Bay company have now pushed their way from Atlantic to Pacific, and their trading schooners make thousand-mile trips through these formerly uncharted waters. Many of the Eskimos have become rich from the sale of furs to the traders and now have their own schooners, some of them equipped with auxiliary gasoline engines.

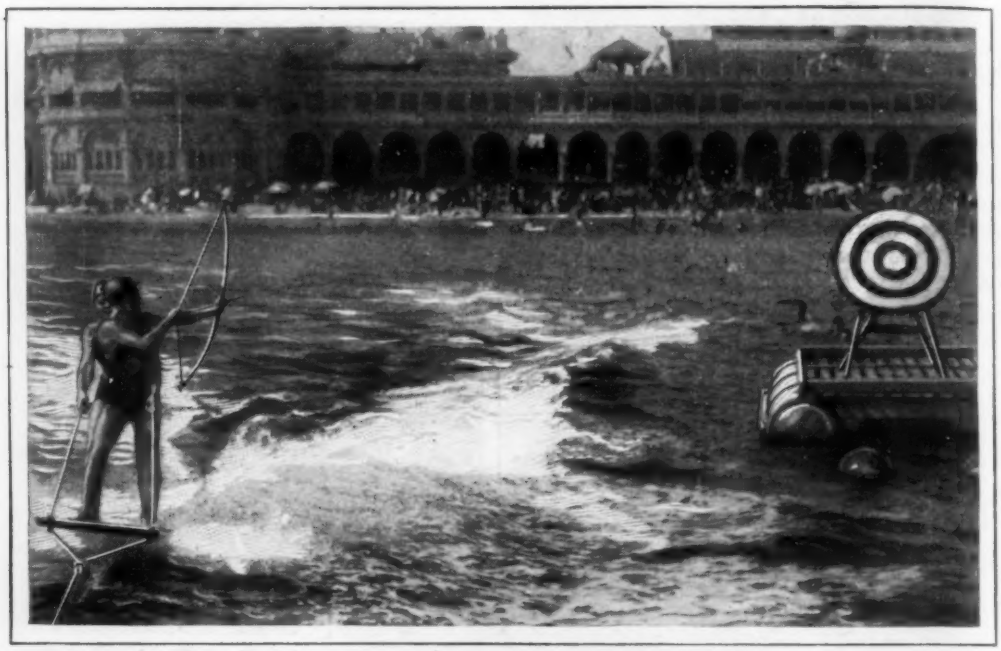
Catching the Swimming Polar Bear, Overtaken in Open Water, and Hauling It Aboard; Right, a Mother Bear Angrily Defending Her Cub as the Boat Approaches

© Keystone View Co.

But despite short summers and long severe winters, when the thermometer drops to fifty below zero and terrible blizzards blow, there is in the veins of the members of the polar fur fleets an irresistible attraction for these desolate regions.

ABSENCE OF FEAR IS VITAL TO BEE HUNTER

Good vision and an absence of fear contribute largely to the success of bee hunters who follow this unique activity with considerable profit and enjoyment in the Ozark mountains and other parts of the country. Some men have taken as many as fifteen and twenty trees in one season in Arkansas. As each tree yields forty-five or more pounds of honey, which has a ready market, the work of the bee hunter is often well rewarded. Keen eyesight is a distinct advantage, experienced bee men declare, since it enables the hunter to detect the line of flight from the baited hive to the tree so he can follow the insects. Journeys of several miles are often made by the bees from their own nest to the lure which has been placed for them. Some hunters beat tin pans or ring cowbells to attract the bees as they are swarming from their tree so that they can capture them and add the colony to their own apiary. Experts, those endowed with a natural "feel," are able to hive a wild swarm without using mask or gloves. A feeling of confidence and a total absence of fear are said to be the best assurance against being stung by the bees.



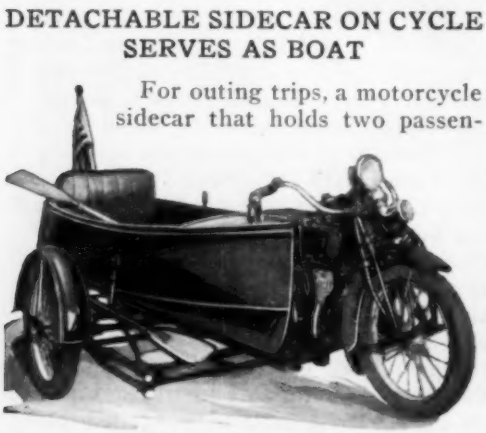
New Tests of Skill for Archers and Surf-Board Riders Are Afforded in the Latest Beach Game, Shooting Arrows at Floating Target from Aquaplane; Riders Must Also Display Teamwork

ARCHERY FROM SURF BOARDS LATEST BEACH SPORT

Aquaplane archery is one of the latest diversions on a California beach. Two persons ride on a surf board behind a motorboat, one to steer and hold the plane steady, while the other shoots arrows at a floating target supported on pontoons. Skill is demanded of both archer and companion to score a hit.

DETACHABLE SIDECAR ON CYCLE SERVES AS BOAT

For outing trips, a motorcycle sidecar that holds two passengers, may be detached for service as a boat. It is shaped to cut through the water with a minimum of resistance and may be used with an outboard motor or oars. Only a few minutes are required to remove it or put it back.

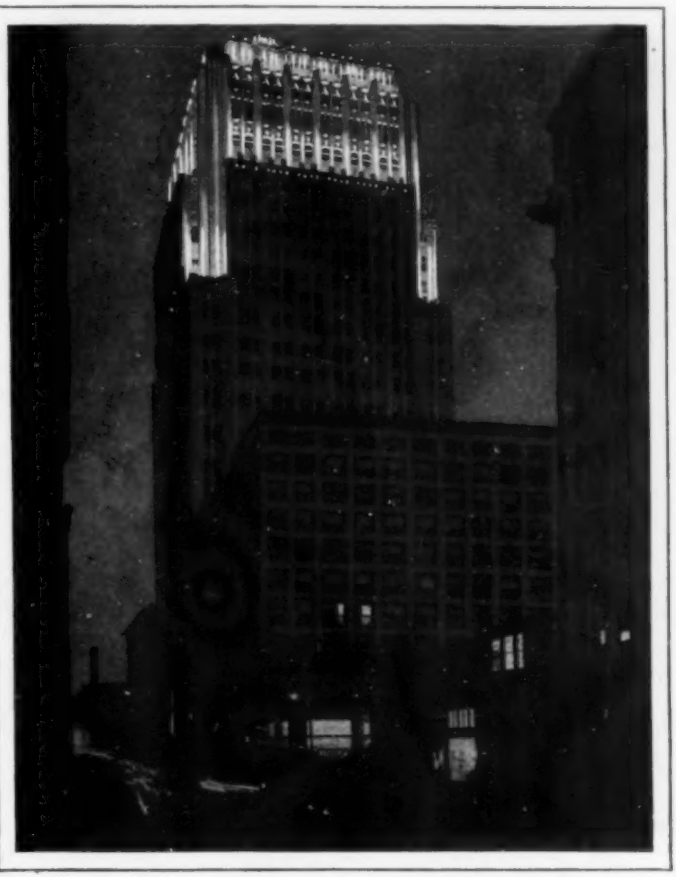


Double-Purpose Motorcycle; the Sidecar Is Quickly Transformed into a Boat When Detached

MAPPING ALASKA FROM THE AIR UNCOVERS NEW RICHES

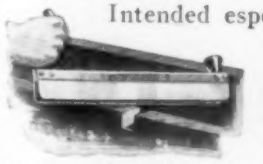
Unsuspected wealth in water power and timber supplies has been discovered in Alaska by cameramen engaged in making an aerial survey of the 25,000 square miles of territory in the southeastern section. Near Ketchikan, for instance, a network of hitherto unknown lakes has been revealed and a single valley there, engineers estimate, will be able to deliver 85,000 horsepower in one large hydroelectric system, promising development of pulp and paper mills. Several rolls of film sufficient for thousands of feet of airplane mosaics have been taken. The entire task is expected to require four years. The burden of the expedition this year was borne by the navy, with twelve different government bureaus watching and assisting wherever practical. The actual mapping was done from two airplanes. A third,

equipped with radio and in constant communication with the others, remained at the base, prepared to take off at a moment's notice. Carrier pigeons were taken on the longer flights, but of those used only a young one on its first flight returned. The two planes, flying in line at an altitude of 10,000 feet, mapped a strip nearly 100 miles long and fourteen miles wide in an hour, as each camera photographed an area about seven miles wide at one exposure with its three lenses. The craft are amphibians, equipped for service on land, ice or snow, and were used by Lieut. Comm. Richard E. Byrd during his preliminary polar flights in 1925. The wheels fit into a pocket arrangement when the plane is in the air or on water and the motor is arranged to afford greater power and better lubrication. The mapping expedition is considered by some persons fully as spectacular as the dash over the pole. The region abounds in mountains from 10,000 to 20,000 feet high. The rougher parts of the country have defied land surveyors and lumbermen. Many of the small islands are practically inaccessible as they are surrounded by ice floes from the glaciers. The region is noted for its heavy rains.



Floodlighting at Night Brings Out the Decorative Detail Until the Building Resembles a Gorgeous Temple Set in the Sky

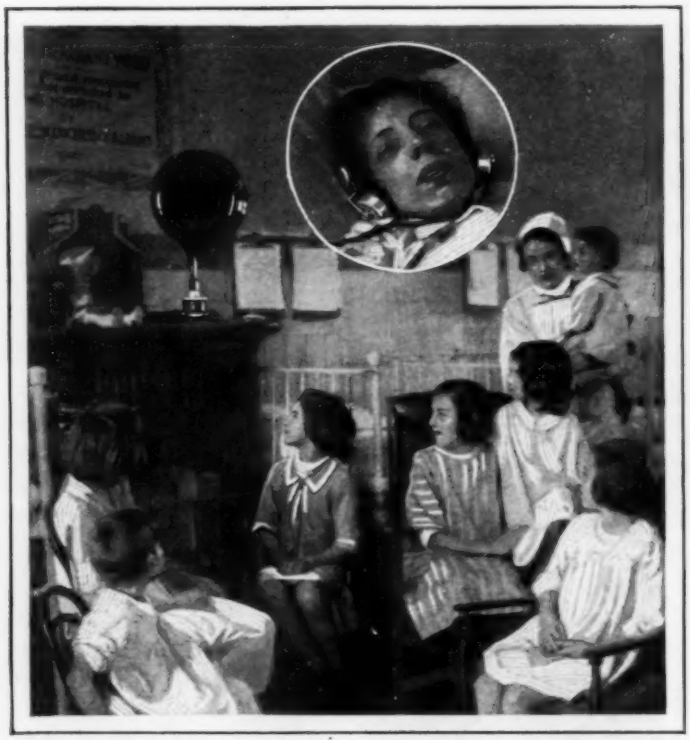
DOUBLE SAW TO CUT NOTCHES SAVES CARPENTER TIME



Intended especially for cutting notches in joists, a double-bladed saw is said to do rapid and accurate work. It insures a slot of uniform width and even sides, saving extra sawing and measuring.

LATEST IDEAS IN ARCHITECTURE EMBODIED IN SKYSCRAPER

What is regarded as a step forward in architecture is seen in the new telephone building in San Francisco and in several other large skyscrapers of recent construction. Many precedents have been set aside. For instance, all "sides are front and all boundaries are of equal importance," so that the building dominates the scene from whichever point it is approached. A minute scheme of decoration has been followed, calling for the application of creative art. The structure cost about $4,000,000, has twenty-six stories and is 436 feet high from the pavement to the base of the flagpole. An elaborate system of floodlighting at the top makes the building look at night like a fairy temple set in the sky.



Some Radio Fans May Tire of the Programs, but Hospital Inmates, Especially the Children, Are Always Pleased with Wireless Hour

RADIO PROGRAMS IN HOSPITALS HELP PATIENTS RECOVER

Physicians declare that radio is of great benefit in hospitals as it takes the patients' minds from their illness and develops cheerfulness. Children, particularly, enjoy the concerts, and the story hours are as popular in the sick wards as in the homes. In England, here and in other countries, many hospitals have been equipped with complete receiving outfits, including loud speakers and headphone sets that may be plugged in at the bedside without disturbing others. Several institutions for soldiers have been fitted with radio through the generosity of the public.

COPPER MINED BY INDIANS FOR TRINKETS AND TOOLS

Many years before the great smelters of today were in operation, Indian tribes of Wisconsin had learned how to extract copper ore and were pounding it into tools and ornaments. Evidence of this is found in hundreds of relics that have been picked up in various parts of the state from graves, sites of old villages and mounds. It is estimated that more than 20,000 copper objects have been collected. The most primitive tools were employed to mine the ore. These included stone hammers and mauls for breaking up the rock, wooden wedges, paddles and shovels for removing the loose dirt, and crude wooden poles and levers for lifting the ore out of the pits. From the mines, the copper was carried by canoe, or by foot over the Indian trails, to the villages where it was manufactured. Apparently the objects were fashioned by hammering, cutting and grinding the ore. The attractive color of the metal was its chief virtue to the Indian, aside from its ease of preparation, and investigators declare that the Wisconsin tribes did a brisk business in copper with other Indians not only in the east but that they traded as far south as the Gulf of Mexico.

SHARPENER FOR RAZOR BLADES WHETS ANY STYLE

All kinds of safety-razor blades can be sharpened in a leather-lined pincer-shaped arrangement that is held between the thumb and fingers, the blade being inserted in a narrow slot. Pressing the sides of the clamp together and tilting the razor edge slightly upward, smooths the blade's minute teeth back into alinement. A thin coating of dressing applied to the jaws preserves them and improves the blade.

METAL DIRIGIBLE FOR NAVY TO MAKE LONG FLIGHTS

Using hydrogen instead of helium, the all-metal dirigible for which contracts have been let by the navy department, is expected to have a cruising radius of 2,200 miles and will carry twelve persons including a crew of four. The craft will be about one-fourth the length of the "Los Angeles" and have but one-twelfth the gas capacity. Its diameter will be fifty-three feet at the widest point. A corrosion-resisting coating will be applied to the outside. Two gasoline motors, of 200 horsepower each, will give the dirigible an estimated speed of seventy miles an hour. The operating car will be built as an integral part of the keel instead of being swung underneath.

MOCK GRAVES BY BOULEVARD HELP TEACH SAFETY

Tombstones with sarcastic epitaphs, describing the fate of imaginary victims buried below, are intended to spread the gospel of safety first among motorists who visit a service station on a California boulevard. The legends emphasize some of the commoner mistakes drivers make and indicate the disastrous results that not seldom will follow them.

Mock Graves with Sarcastic Epitaphs outside a California Service Station Teach Driving Lessons

Saving Searches in Dark Interiors, This Revolving Closet Rack Holds Many Articles

ROTARY STEEL CLOSET RACKS SERVE AS DUMB WAITER

Troublesome searching for articles is eliminated in a revolving set of racks to lighten household duties. There are two separate fixtures, each rotating independently and fitted with an assortment of hangers, baskets and shelves for a wide variety of goods. Instead of hunting through a dark room, the user has but to turn the racks about until the article desired is found. Placed between rooms, the arrangement may serve as a dumb-waiter, saving steps from kitchen to dining room, for instance. The installation is suited to dust-protected closets and is placed high enough above the floor to permit easy cleaning.

Learning to Putt with Aid of the Guide; Club Moves Correctly through the Entire Stroke

Courtesy P. A. Valle

GOLF-STROKE GUIDE FOR PUTTS HELPS IMPROVE GAME

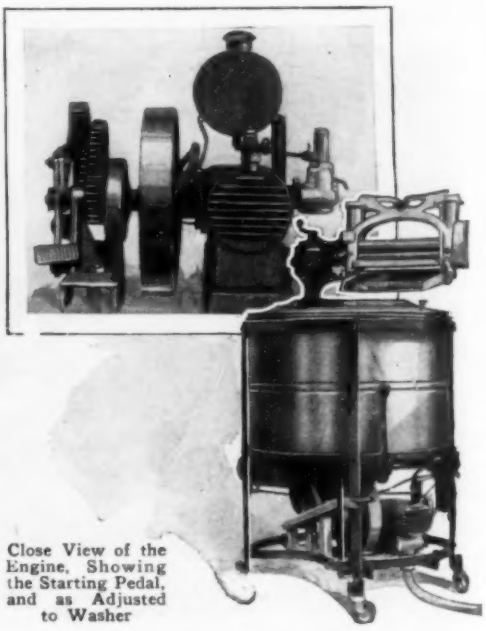
Skill at putting is considered one of the most important assets of a good golf player, and to develop proficiency in this phase of the game, an adjustable apparatus for the beginner or the experienced player is said to demonstrate the essential principles of the correct stroke in a few moments. Exercising with it is intended to familiarize the user with the proper position for the club at the moment of striking the ball and as the sphere rolls away. In the machine, the putter is moved through the entire stroke in the correct manner, as it is adjusted for such action irrespective of the user's swing. Special shots are also demonstrated with the rigging, which can be set to suit the person's strength. It follows the idea the baseball player has in swinging three bats to come through faster with one.

FISHING FOR SILK

Many precious articles such as gold, coral, amber and pearls are obtained from the ocean, but few persons know that some of the finest silk in the world is given up by the sea. In certain parts of the Mediterranean, is a species of mussel, with shells about three inches broad and seven inches long, and each of them contains a small hank of delicate fiber. At first glance it attracts little attention, being soiled with mud and the remains of marine plants, but when it is washed and combed, the fibers are seen to be extremely lustrous, glistening in the sunshine in shades varying from a golden yellow to olive brown. Only workers specially skillful are engaged in the spinning process, yet once this is done successfully, the yarn may be woven into shawls and wraps, stockings, gloves and neckties as well as dresses, hats and laces. In its natural state, the mussel silk is so much sought after that it commands a high price.

ENGINE FOR WASHING MACHINE IS STARTED BY FOOT

Motive power for the washer or for various light machines in the shop is furnished by an air-cooled gasoline engine which combines several special features. One is the starting mechanism, a ratchet-controlled foot lever which turns the engine over several times with a single stroke. Another is the governor, built into the flywheel. It actuates two elec-



Close View of the Engine, Showing the Starting Pedal, and as Adjusted to Washer

trical contacts to open or close the circuit to the spark plug. When the speed exceeds the proper rate, the governor draws the points apart, breaking the circuit and causing the engine to miss. The motor takes up but little room and consumes a small amount of fuel.

FRESH-EGG TESTS FOR HOME

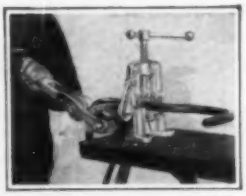
How to tell a fresh egg from one which has been stored or which for any other reason may not be up to standard is revealed in a recent bulletin of the Pennsylvania state college poultry specialists. A fresh egg, they say, should have a sound clean shell and show a dull "bloom," or very dull luster. The egg that has been held for some time, particularly where it may have been heated, will show a decided gloss. This is very noticeable on partially incubated eggs. A mottled shell sometimes denotes age. If decomposition has started within the egg, the shell sometimes shows a grayish tinge. Shells that are stained usually indicate the eggs have been in contact with moisture and are, therefore, of inferior quality. Eggs that have been preserved in water glass or lime will show a roughened shell, because some of the chemicals adhere to it. An egg that has been washed with acid will show a very porous shell, and processed eggs are usually detected by their oily or waxy appearance. A fresh egg, when opened, should have the following characteristics: The yolk should stand up well and have a definite shape, the white should hold together well and show a thick viscous consistency near the yolk; there should be no disagreeable odor, and the white should not have a "runny" appearance. In addition, a fresh egg will cook in any manner without falling to pieces.

"Skiing" across the Water; Balanced Boats for Each Foot Simplify the Stunt and Poles Help in Propelling and Steadying

SKI WALKING ON CALM WATER LATEST OUTDOOR SPORT

Water skis devised by a German inventor are like small boats strapped to the feet and are so balanced that they may be used with ease and safety when the weather is calm, according to reports. Poles help the wearer propel and balance himself.

VISE FOR BENDING SMALL PIPE SAVES TIME AND LABOR



One-half or three-quarter-inch pipe may be cut, threaded and bent without removing it from a special vise now on the market. It is adjustable for bending downward or sidewise, is said not to flatten or kink the pipe, and requires no special skill to operate.

© Harris & Ewing

Bee Keeper at Government Experimental Farm Photographing a Hive as the Latest Method of Getting a Quick Brood Count

CAMERA COUNTS BEES WHILE SCALE WEIGHS THEM

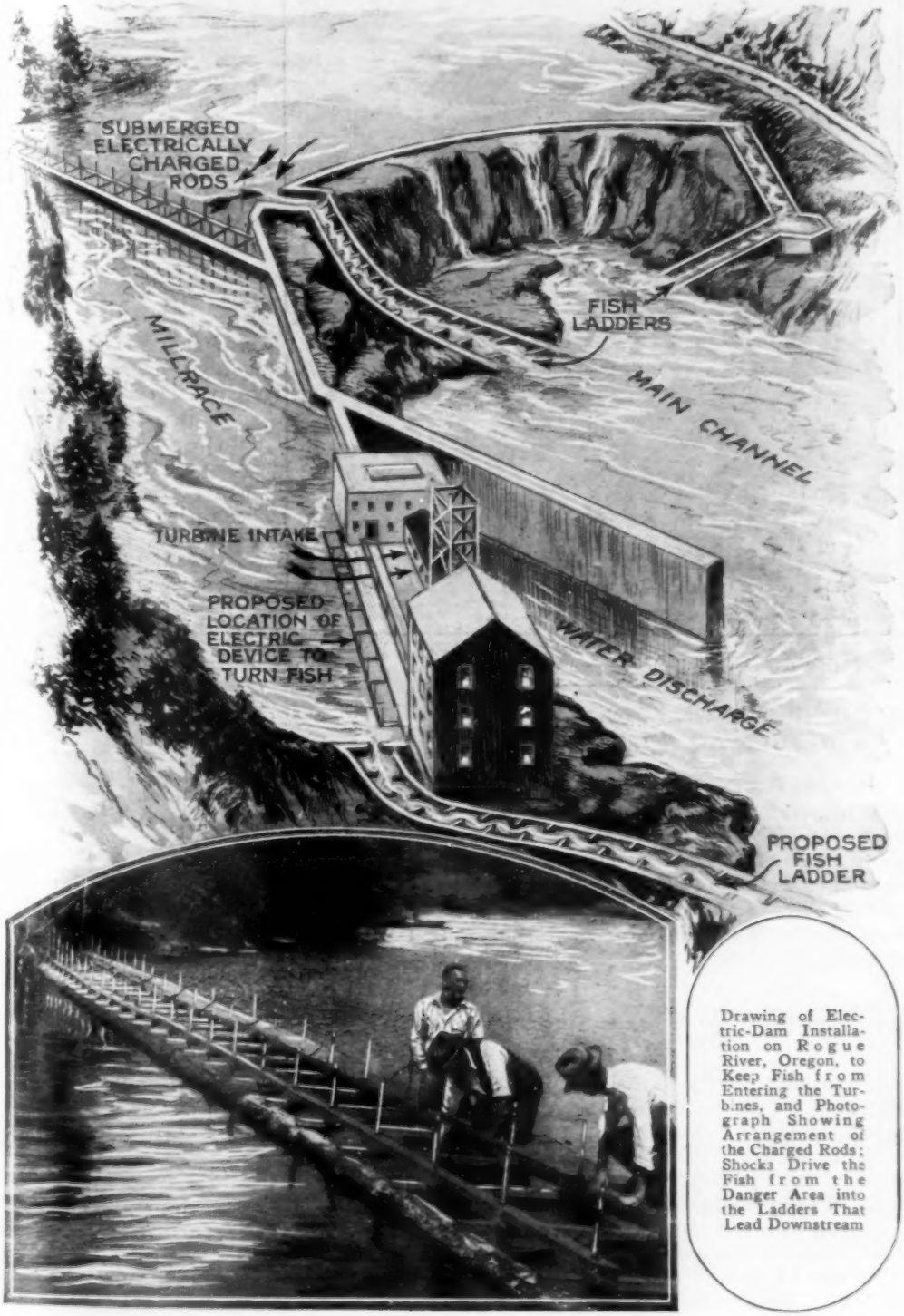
Using a camera to record the number of brood cells in a honey beehive and a fine registering scale to keep constant check of their weight hour by hour as they bring in the nectar, government scientists are fast systematizing the work of the bees. Through their recording apparatus they obtain data which, when checked with the weather-bureau records, show the influence of sunshine, clouds, dry air, high humidity, heat, cold and other factors on the gathering of honey. They have found, through the scales that keep a constant record of the hive weight, that during the early morning there is little nectar brought in, but after the sun is well up, the hive weight begins to increase and keeps on growing until sunset, when it stops abruptly. The chart of the recording scales shows plainly the flight of the bees as they leave and their return with a cargo of nectar. The weight increases fastest during bright sunshine, the growth stopping suddenly for any sudden chill or rain. The use of the camera to keep the brood record has ended the laborious process of counting each cell and avoids chilling the bees. The bees store surplus honey for their owners during only six weeks of the year, so the department is experimenting to find a way by which the brood of workers can be brought to maximum strength just before the six-week period starts, insuring a large surplus crop.

Scale Car for Weighing Coal in Germany; Balances Are Installed in Rear and Weigh Automatically

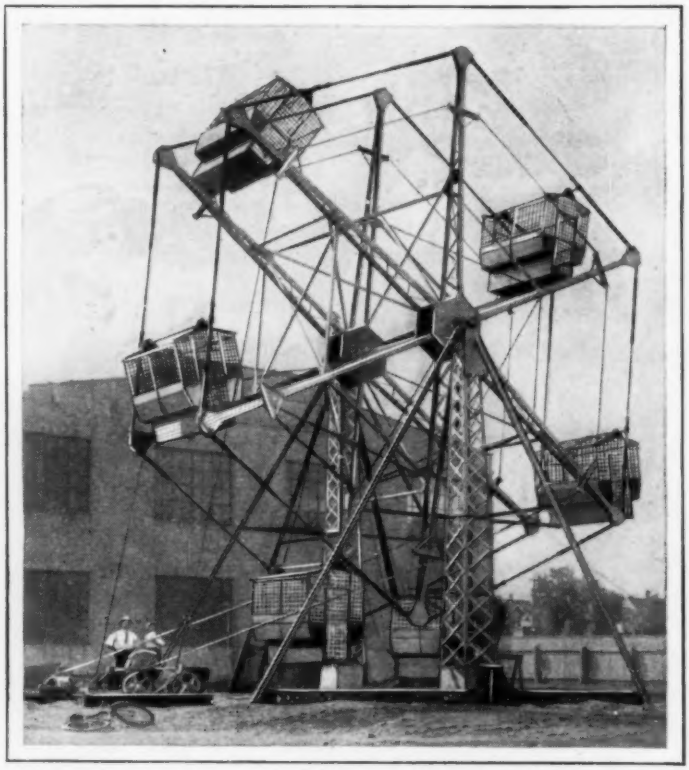
MOTOR COAL SCALE INSURES HONEST WEIGHT

Customers of a German coal company are assured of obtaining the exact amount they order by means of a special set of scales attached to a motor truck. The balances are driven to the house where the coal is being unloaded and as each basket is weighed, the pounds are automatically recorded by a stamp on a strip of paper. The net weight is calculated by deducting that of the baskets or bags containing the coal.

ELECTRICITY FORCES FISH TO USE SAFETY LADDERS



Drawing of Electric-Dam Installation on Rogue River, Oregon, to Keep Fish from Entering the Turbines, and Photograph Showing Arrangement of the Charged Rods; Shocks Drive the Fish from the Danger Area into the Ladders That Lead Downstream



Putting a New Twist to the Staid Old Ferris Wheel; the Cars Slide Twelve Feet at Two Points in Each Revolution

SLIDING CARS ON FERRIS WHEEL PRODUCE ADDED THRILLS

Some of the thrills of a toboggan slide are enjoyed in a type of Ferris wheel with cars that slip down a twelve-foot runway at two points in each revolution. They remain swinging until the next slide. The wheel is fifty feet high, weighs twenty-one tons, and each of the six carriages holds fourteen persons.

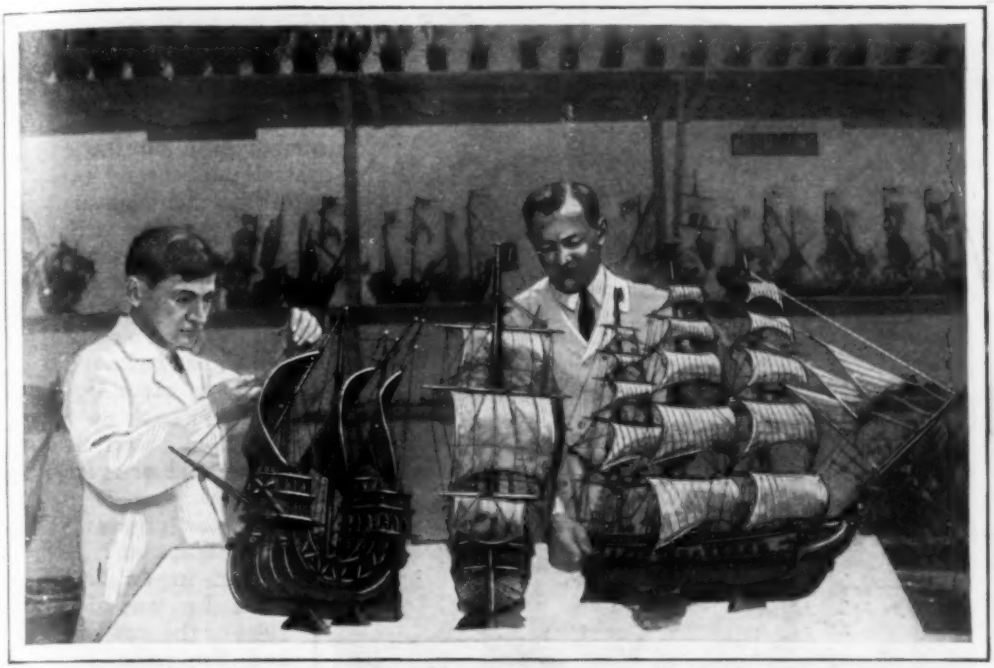
NEW CLAY AND METAL MIXTURE AIDS ELECTRICAL WORK

Useful particularly in the chemical and electrical industries, a new substance prepared from fine clay or refractory oxides with a metal reinforcement by German experts, has peculiar properties. After firing, it becomes hard so that it gives out a ringing sound if struck. It resists sudden changes of temperature. Bricks made of it can be heated red-hot and thrown into cold water without cracking. They can be dropped on a stone floor without breaking and can be destroyed only by crushing. The material is said to be a good heat conductor and has a variable electrical resistance so that it can be used as a heat element. It also resists chemical reactions of various kinds. Hollow tile, and tubing with a thickness of only .002 inch, have been made from it, yet it has great mechanical strength and a high degree of elasticity. A ribbon of the substance can be wound into a spiral, bent to sharp angles, yet will not break. So far, it has been used for fashioning tiles, muffles, tubes and similar hollow articles that have to be exposed to high temperatures as well as insulators for crucibles and the like. Apparently, the combination of metal and clay by this process is not merely a mechanical one.

INLAID WOODEN BOX CONTAINS ELEVEN THOUSAND PIECES

Spare time for a period of twelve years was devoted by an Italian cabinetmaker to the fashioning of an inlaid wooden treasure chest, a foot square and eight inches high. It is made of five kinds of wood and contains 11,968 separate pieces.

Inlaid Treasure Chest with Its Thousands of Pieces in Intricate Design



Perpetuating American Marine History in Models; Replicas of Famous Ships Fashioned in Realistic Detail for Collections; Models of the "Santa Maria," the "Constitution" and the "Mayflower" Have Been Made

SHIPS THAT MADE HISTORY ARE REPRODUCED IN MODELS

Several vessels that have helped to make American naval history have been realistically reproduced in accurate models by two New York craftsmen. The collection includes replicas of the "Constitution," the "Mayflower" and the "Santa Maria." The builders were metal workers and cabinetmakers before turning their talents in the direction of ship models.

SPIDERS ARE GOOD MECHANICS IN BUILDING WEBS

Spiders use plumb lines, struts and guy wires with skill that rivals that of an experienced engineer, according to the observations of a French naturalist. He decided that their cunning could not be explained on the ground of mere instinct but revealed an ingenuity akin to intelligence. This was shown by the fact that each insect had a different way of making repairs. For instance, after the web had been started by dropping a plumb line to give the spider the sense of the vertical plane, an obstruction was placed in such a way that the web sagged. The spinner sought to repair the damage by means of struts and braces arranged to pull the fibers back to position. But not all the spiders, not even those of the same variety, proceeded with this adjustment in the same manner.

FOLDING CANVAS CAMPING PAIL SERVES AS MINNOW BUCKET

With a capacity of eight quarts, a collapsible canvas pail with a metal bottom

Pail Extended and Collapsed for Packing; Side Braces Keep the Canvas Rigid

can be folded down to an inch in thickness. It may be used as a minnow bucket and for many other purposes on outings.

Christening the "Cyclops" the Army's Giant Bombing Plane; Engineers Predict That It Will Be Able to Make Trans-Oceanic Flights

SINGLE-ENGINE BOMBING PLANE TO FLY TWENTY-FOUR HOURS

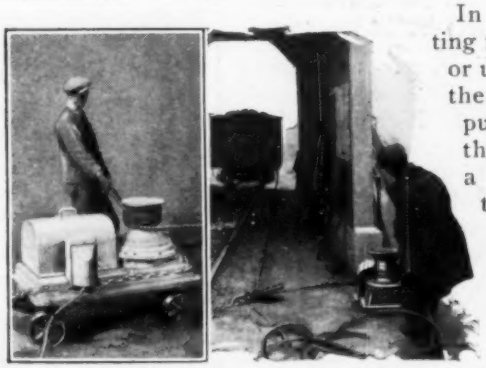
Christened with a bottle of ginger ale, the U. S. bombing plane "Cyclops" has been added to the army air service. This single-motor ship weighs 17,000 pounds, has 825 horsepower and is designed to carry 4,000 pounds of bombs over a cruising time of eight continuous hours, or can fly twenty-four hours without ammunition. It is planned to install a 1,200-horsepower motor with twenty-four cylinders. This will permit a speed of 135 miles an hour, and with its enormous fuel-carrying capacity, the craft should be able to make transatlantic flights with little difficulty, in the opinion of expert aeronautical engineers.

OCEAN TEMPERATURE ON COAST RISES FIFTEEN DEGREES

Always a source of perplexing mysteries, the sea has presented a new puzzle on the Pacific coast by a rise of fifteen degrees in temperature. A ship captain made the discovery while sailing off Oregon and Washington and also found evidence of an inshore current which had to be reckoned with in steering. The question has now arisen, will this warm flow be permanent or is it just a temporary result of some great earth movement on the sea bottom? A mild season in Alaska was noticed as one of the results of the warm current and fishermen reported variations in their catch because of the change in the temperature of the water. The effect of currents on climate is noticeable elsewhere. Oslo, the capital of Norway, is in approximately the same latitude as the southern part of Greenland but instead of being covered with an ice cap, that country is fruitful and populous. This is due to the warm Gulf stream which washes the shores of northern Europe.

ELECTRIC FREIGHT-CAR PULLER DOES WORK OF SIX MEN

In the operation of setting freight cars in loading or unloading positions on the tracks, an electric puller is said to do work that ordinarily requires a gang of six men and to consume but little current. It consists of a revolving winch fastened to a heavy base and winds up a cable attached to the car. It can also be used for hoisting.



View of Puller on Small Truck and in Use in Railroad Yard Setting a Freight Car

ROYAL PRIVATE TRAIN PIPED FOR TOBACCO SMOKERS

A pipe that comes in the public-utility class, with mains to deliver the smoke direct to the consumer, has been installed in a unique private train built for the Nizam of Hyderabad, richest and most powerful of the Indian potentates. The pipe, which is a hookah, or what is known in this country as a Turkish water pipe, is an enormous affair installed in the engine and operated by the crew. Each car in the train is connected to the tobacco-smoke mains, with a mouthpiece beside each chair, so that wherever the Nizam may chance to sit he will find his smoke ready. The ruler's traveling habits are unsettled, so the train is kept in readiness twenty-four hours a day at his own private station. Every eight hours a fresh engine is attached, and the crews report for duty at the same time.

PORTABLE COURT FOR SPEEDER SAVES TRIAL DELAYS

Justice travels on wheels in a California city. A portable court, housed in a special motor car, tours streets and boulevards so that the judge can rule on a traffic case a few moments after an arrest has been made. This relieves congestion of regular city dockets and helps offenders as well as saves the time required for appearing and waiting at later hearings.

Prompt Hearing of Traffic Cases Is Afforded in This Traveling Court, Convened at Roadside; Plan Works Successfully in California

Weighing In Sloop at Belmont Harbor, Chicago, before a Race; Scale Itself Weighs Nearly a Ton

SCALES FOR WEIGHING BOATS HELP DECIDE RACES

Determining the winner in a boat race is often a complicated problem, for many factors, including length of the ship's water line, its sail area, draft and displacement must be considered. Sloops are weighed in on a big scale suspended from a crane. The balance itself weighs about a ton, is seven feet high and registers between 8,500 and 11,000 pounds on a graduated dial. The racing rules require that the boats should be fully equipped for running when attached to the scale. In the accompanying photograph, a "Class R" sailing yacht is being checked preparatory to entering a race to be run under the auspices of the Chicago Yacht club.

How to

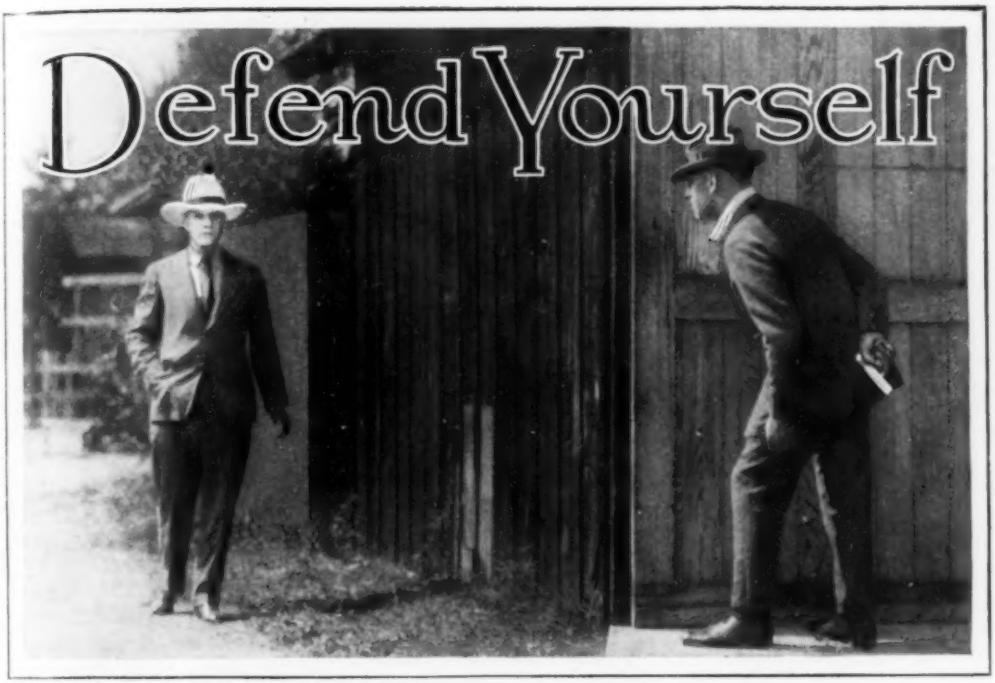
No blanket rules can be set down to offer complete defense against the attacks of strong-arm bandits and bullies, but a generalization of methods of defense can be made which will serve almost every purpose. First of all, it should be remembered that all rules of fair play have no part in dealing with an adversary who is obviously outside the pale of law and order, and public decency. The problem of the person on the defensive is that of getting the best of the attacker by brain work and doing it in the quickest and most effective way.

STRATEGY is more effective than strength if one only knows how to use it in dealing with bullies, ruffians or holdup men. A frail five-foot man can, figuratively, make a whipped dog out of a seven-foot rogue if he knows how to use his brain to make up for his inferiority in physical power.

There is even a way to prevent being held up at the point of a gun which is about ninety per cent effective, if one only knows the trick. That is the simple expedient of keeping one or both hands in one's pockets while passing through locations where a holdup might be attempted. No bandit, except one bereft of his sense, or with a reckless disregard for retaining a whole hide, would ever try to hold up a man whose right hand reposes languidly in his coat pocket. The bandit has no knowledge that the hand in the pocket may not repose upon the butt of a pistol. The wise stick-up man therefore chooses for his victim one who can be told to "reach for the sky" without the possibility of bringing a trigger finger unexpectedly into action.

The element of surprise movement is just as important to an individual seeking to defend himself as it has always been with armies. Catching the enemy unawares, and upon a quarter where he never anticipated an attack, is always one of the surest ways of getting the best of him. Thus, the big bully who launches an assault upon a person of lesser physique is usually taken completely off his guard when the little fellow hauls off with a quick fist—and plants a blow squarely in the pit of his opponent's abdomen. When this happens, the fellow who received the blow usually folds up like a jackknife, and spends the next two or three minutes gasping for breath, or howling with pain. We say that such a blow "knocks the wind out of one." It does that figuratively but not literally. The jolt from even a fairly weak abdominal punch is absorbed by the intestines, the spleen and the lower part of the stomach. There are no bones to protect these vital organs from serious, or even fatal, injury. A blow of equal force could be landed upon the chest without the slightest injury to the recipient.

Defend Yourself

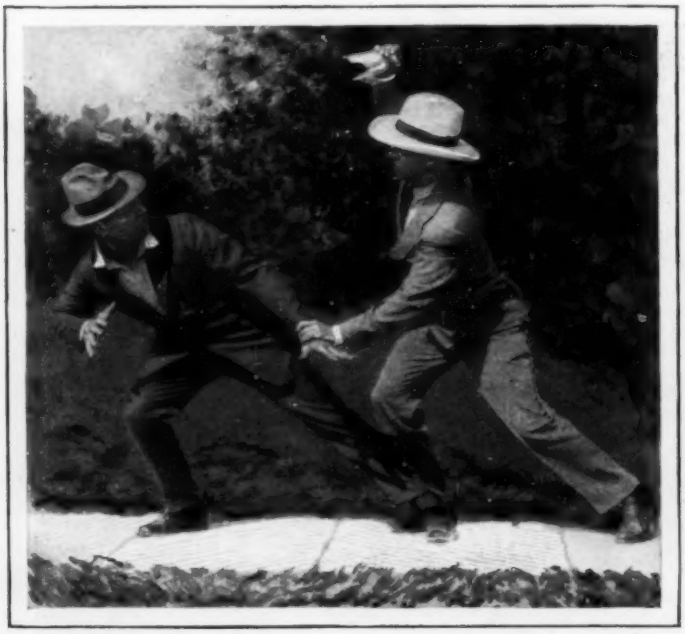


Next among body blows for putting an attacker out of combat, the groin is about the most vulnerable part of the body. Moreover, a bully or rogue seldom expects his harmless-looking victim to make use of his feet in defending himself. He is therefore taken completely off his guard, and is knocked out cold when the intended victim lets fly with the point of a shoe which catches him in the groin. If the person on the defensive wears heavy shoes, the kick is so much the more effective.

Umbrellas, canes, walking sticks, hatpins and many other articles which people commonly carry, may be used as thoroughly efficient weapons for repelling the most vicious attacker, if one knows just how to wield them. A person who is attacked while carrying an umbrella usually makes the mistake of attempting to use it as a club. A clubbed umbrella is scarcely more dangerous than a big feather, but the same umbrella, if thrust into an attacker's face, automatically becomes a dangerous javelin. It will gouge out an eye, rip the nose, or tear into the mouth or cheeks like a sword. An umbrella with the point dressed down by a few strokes of a file also is a terrible weapon when used javelin-fashion.

The intended victim of an attacker, who carries a cane or walking stick, usually clubs down upon his opponent in an effort to defend himself. It would require a very heavy cane to inflict any serious injury by a downward swing of that instrument. An arm suddenly raised will ward off the blow completely. But, let the walking stick wielder swing his improvised weapon horizontally, like a Chinaman lets drive with a broadsword, and even a light walking stick becomes a dangerous, or even deadly, weapon. With a cane swung horizontally, the man defending himself is more apt to catch his assailant unexpectedly. The blow is aimed upon the side of the head, and a good stiff jolt there will make a huge bully see stars. It may break an eardrum, or cave in the side of the skull at a point where it is very thin. If the blow can be landed slightly below and a little behind the ear, even a light walking stick will crush the skull.

Fist blows aimed at the face are effective, but as a means of self-defense are not so good, especially since the average ruffian is usually something of a pugilist, and probably of physique superior to his intended victim. The little fellow, therefore, should endeavor to defend himself,



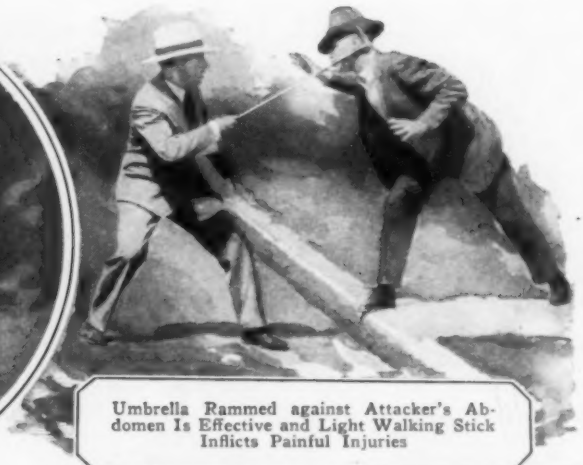
Pose Illustrating How a Quick-Thinking Citizen Used a Jagged, Broken Milk Bottle as Dagger to Rout Burglar

bearing in mind that fingernails gouging at his enemy's eyes are more apt to inflict serious injury than a small weak fist bringing up against a hard lantern jaw. Hatpins, for women who wear them in these days of small hats and bobbed hair, are, and always have been, potential weapons of self-defense. They are to the owner, when wielded in the direction of an opponent's eyes, precisely what the cat's claws are in turning an angry dog. Women and girls who are annoyed by "mashers" have the most effective means of curtailing such annoyance by the use of a little cool-headed wit. Instead of displaying antagonism, they have but to feign approval—and then pass the annoyer over to the nearest policeman.

In cases of personal combat, where the person on the defensive has been seized, or has clinched with the antagonist, the most effective defense available is to make quick and decisive use of one's teeth. A study of police records of hundreds of attack cases reveals the fact that only one person in fifty ever seems to remember to bite the assailant when there is no other available method of worsting him. Yet many instances also are recorded of persons who have completely defended themselves from attacks by making use of the teeth. A physically weak person can easily trim a finger off the hand of a husky rogue, or make such a dent in his hand or arm that he'll think of nothing but the pain.

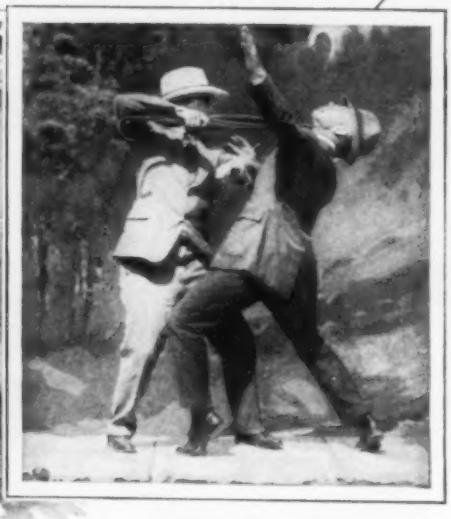
Among classes of persons who frequently have occasion to act in self-defense, newspaper reporters and photographers probably head the list. They are constantly called upon to interview or photograph persons who don't desire to be interviewed or photographed. Arguments and attacks are the logical outcome. There are innumerable opportunities for such squabbles, but they are always avoided by using a few of the repelling methods known to every newspaper man. Some of these methods are worth reciting here because they can be adopted or modified to meet the requirements of most persons in moments of urgent self-defense.

The newspaper photographer's ever-handy weapon of defense is the very camera that so often gets him into trouble. Few would expect a press photographer to use his camera either as a shield or as a weapon. Thus such use of it has the tremendous advantage of surprise. A fifteen-pound camera when suddenly lifted to shield one's face from a fist blow offers splendid protection, as well as shock-absorbing qualities that will probably cause more damage to the fist than to the camera. Likewise, the same camera, when swung by the handle, becomes a weapon that will crack a head—or better still, send the opposing party scurrying beyond harm's way. The reporter's favorite weapon is a leadpencil held like a dagger against the ball of the thumb and thrust in the direction of the antagonist's face. No sane person will risk an eye against such an implement. Hence the threat in most cases ends the encounter before active warfare begins.



Umbrella Rammed against Attacker's Abdomen Is Effective and Light Walking Stick Inflicts Painful Injuries

Even Your Belt Buckle May Serve in an Emergency; Buckle Swung Hard and Horizontally against an Assailant's Head Easily May Fell Him



Another Form of Umbrella Attack; Using It like a Javelin

Few Attackers Can Withstand the Daggerlike Thrust of an Umbrella Point in the Face; Right, Swinging Light Cane against Assailant's Knee Cap to Cripple Him

In the development of improvised weapons of self-defense there are absolutely endless possibilities, depending, of course, largely upon the resourcefulness and initiative of the individual. Pins, belts with metal buckles, a shoe jerked off the foot and clubbed by the toe end, sticks, stones, tin cans, table glassware and crockery that can be conveniently broken to make a jagged edge, and many other things, are recorded among articles that have been pressed into service by persons desperately in need of means of defense. Wit and self-reliance are, indeed, the most powerful mediums for self-protection when it must be individually furnished.

Many suggestions are contained in police records of persons who have avoided indignities by means of quick thought. A few of these are listed for the valuable knowledge they may offer to others. A physician, who makes numerous calls at all hours of day and night, carries an ounce of red pepper done up in oiled paper, sewed into cheesecloth, and tied on the end of a buckskin thong.

An odd, almost humorous incident of self defense was that of a little fellow who was set upon by a big bully as a result of their respective automobiles having locked fenders. The bully attempted to administer a chastisement upon the driver of the other car, but got a reception entirely unexpected. The little fellow grabbed a small hand fire extinguisher off the dash of his machine, and squirted his attacker in the face with the highly volatile fluid. A policeman who arrived on the scene to investigate the traffic jam found the bullying motorist rubbing his eyes, gasping for breath, and rid of all thought of personal combat.

We would hardly think of a strand of wire as an instrument for overpowering a bandit and delivering him into the hands of the police, but at least one incident of the sort has been recorded. A man was coming home one night when he was tackled by a footpad. A sharp scuffle followed during which the intended victim of the attack became involved with a wire. Quick to think and act, he got the wire off his own feet and succeeded in taking a turn around the bandit's neck with the tin strand of metal. After that, strangling the attacker into submission and leading him to the nearest police call box was the work of a few minutes.

Punches to Abdomen Are Barred in the Prize Ring but Entirely Permissible and Effective against Thugs; at Right, Using a Small Piece of Hand Luggage as Shield to Ward Off Blow; a Camera or Suitcase Will Answer This Purpose

PUMPING LAKE DRY TO FIND GOLD

Urged by reports that large quantities of gold lie at the bottom of a lake in Devil's canyon, near Quesnel, B. C., an American syndicate is preparing to drain the basin. Seepage water is to be diverted by dams and flumes and most of the main body will be carried away by a huge siphon. When all that can be removed in this way has been sucked out, holes will be bored through the bottom of the lake in the hope of striking one or more tunnels which were driven through the sides by previous miners. Two attempts have been made before to empty the lake, which is 100 feet deep at the center, by means of tunnels. A cave-in halted the first effort and, in the second, one man was suffocated by foul air. More than $2,000,000 in gold is reported to have been taken from the bedrock above the lake shore, and Chinamen are said to have scooped out precious metal from the bottom by the simple process of using shovels attached to long handles.

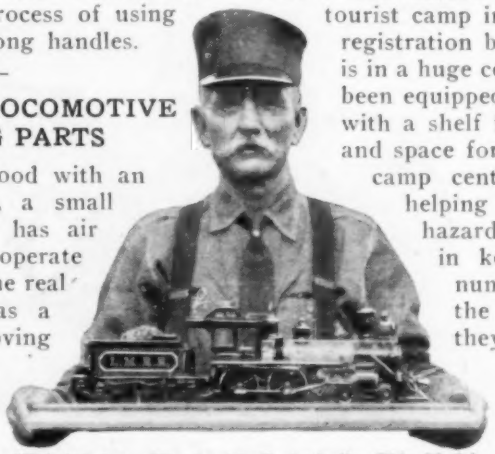
Utilizing an Old Stump for a Tourist-Registry Office; There Is Ample Space for Book and Other Records

BIG STUMP SERVES AS BOOTH TO REGISTER TOURISTS

One of the features of the Denny Creek tourist camp in Washington, is the registration booth for tourists. It is in a huge cedar stump which has been equipped as an outdoor office with a shelf for the register book and space for other records. The camp centralizes the tourists, helping to decrease the fire hazard, while the booth aids in keeping track of the number of visitors and the places from which they come.

CARVED MODEL LOCOMOTIVE HAS MOVING PARTS

Whittled out of wood with an ordinary pocketknife, a small model locomotive has air brakes of metal that operate after the manner of the real equipment as well as a number of other moving parts. It took the man who carved it nearly a year to complete the intricate work.



Whittled from Wood with Pocketknife, This Model Engine Has Metal Air Brakes That Work

¶Only about one oyster shell in a thousand contains a pearl, it is said.

Filling Mask and Wearing It; Principle Is Same as Hot-Water Bottle, but This Holder Fits Snugly and Will Not Slip Off Even if Person Stands

DOUBLE-WALLED RUBBER MASK HELPS RELIEVE PAIN

Fitting snugly about the face, a rubber mask that can be filled with water, is intended to overcome neuralgic pains and to be of aid in skin treatments. The article holds a pint and weighs but twelve ounces when empty. The water does not bulge at any point as it is evenly distributed, and either hot or cold may be used.

ROUTE USED BY PRIMITIVE MAN SOUGHT IN ARCTIC

Seeking historical information rather than riches, an expedition headed by Dr. Ales Hrdlicka, of the Smithsonian institution, has been exploring the rugged, gold-bearing regions of Alaska for trace of the routes used by primitive men in their supposed immigration from Asia. Did the small islands in the Bering strait serve as stepping stones to this continent? Where did they first establish a settlement after their crossing? What course did they take in working their way southward? Answers to these and many other questions were sought in the journey which included a trip down the Yukon from Tanana, the route of the gold seekers of '98. One of the most interesting finds was the remains of an old stone industry. Dr. Hrdlicka found no traces of any really ancient settlements along the Yukon, it is reported.

FUEL FROM WOOD FOR AUTOS CHEAPER THAN GASOLINE

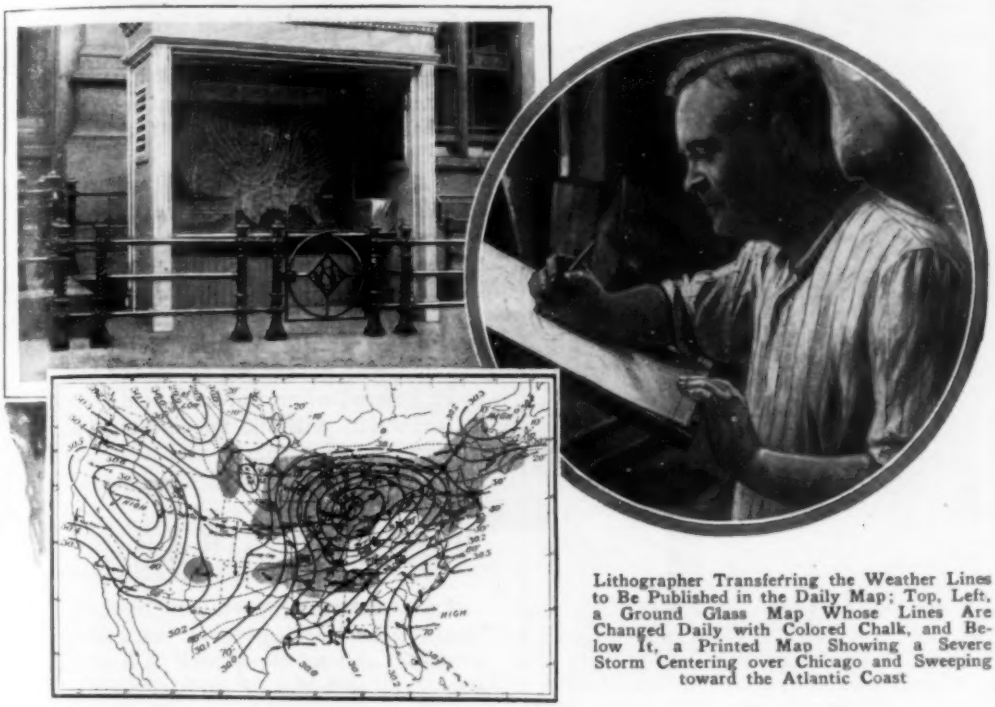
Motoring in Germany, where gasoline is expensive, is expected to become more popular as the result of a Berlin professor's discovery of a process for making fuel from wood. He is said to have prepared twenty gallons of it at a cost of but $3.50, whereas an equal amount of gasoline would have cost $11. By means of a chemical treatment, the wood is changed into an acid and then distilled into a motor fuel. Tests of the substance are reported to have been successful, and car dealers and manufacturers see an increase in their trade from this discovery.

BICYCLE PROPELLED BY "OARS" GIVES HELPFUL EXERCISE

Handles at the sides connected to a chain gear and actuated with a rowing movement propel a bicycle a German has invented to afford the rider beneficial exercise. It is steered by the feet which are supported on pedals near the position of handlebars in the usual wheel.

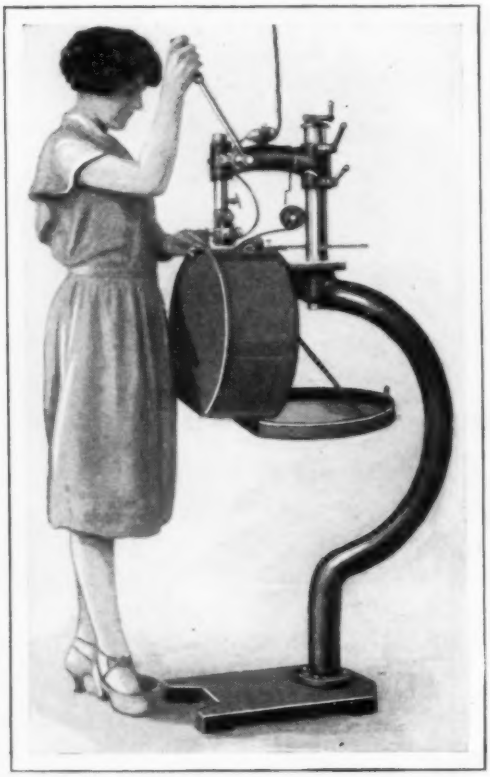
Steered with the Feet and Propelled by Arm Movements, This Bicycle, the Reverse of Usual Kind, Develops Muscle

HOW TODAY'S WEATHER GETS MAPPED FOR YOU



Lithographer Transferring the Weather Lines to Be Published in the Daily Map; Top, Left, a Ground Glass Map Whose Lines Are Changed Daily with Colored Chalk, and Below It, a Printed Map Showing a Severe Storm Centering over Chicago and Sweeping toward the Atlantic Coast

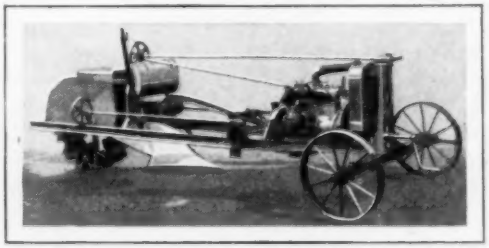
Long before noon each day the entire country has been told by telegraph what the day's weather outlook was at 8:00 a.m. in more than 200 selected spots, and printed maps showing the weather for the entire country are being distributed in Washington and other observatory cities. Behind that speedy gathering and distributing lies a remarkable organization and an unusual degree of efficiency. At 8:00 o'clock in the morning in the weather bureau at Washington a dozen men gather to get out the forecast and map. They include eight map makers, three printers and the forecaster. At the same moment, throughout the country, the local weather observers take their morning readings, put them into code, and file them with the telegraph companies. In preparation for that event, a nation-wide circuit of telegraph lines has been set aside a few moments after 8:00 o'clock, all linked together in an enormous chain. Each city transmits its report in order, and copies the others, so that when the chain is complete, not only Washington but each town on the line has the complete weather returns for the day. The time taken is very short, because of the ingenious code used. It embraces thousands of words, yet is so simple that the forecasters in Washington can memorize its principles quickly and decode all weather reports without looking at the book. As the decoding proceeds, each of the eight map makers enters the data that belong to his sheet. Clouds, temperature, barometer readings and other information go on separate charts, and in addition all the principal information is entered on a master map which, when completed, corresponds closely to the published weather map. With all the returns entered, the forecaster takes the master chart and draws in the isobars and isotherms, the former lines connecting points of equal barometric pressure and the latter connecting points which have reported equal temperature. The isobars are important because they mark the limits of the various high and low-pressure areas which in their movement over the country determine changes in the weather. Then, the forecaster dictates his weather predictions for the next twenty-four hours.



With Electric Heater for the Gold Leaf, This New Stamping Machine Will Take Large Objects

GOLD-LETTER OUTFIT STAMPS BIG AND LITTLE OBJECTS

Printing names, emblems, and other identification marks in gold on leather goods, large or small, is quickly and easily done by a patented stamping outfit which combines a number of serviceable features. These include a "three-speed" electric heating unit for the gold, which is supplied in one-hundred-foot rolls, two inches wide; two working platforms and a curved column, which permits handling a piece as large as a twenty-inch hatbox. The stamper is said to operate on rough as well as smooth leathers. A wide variety of type styles and designs can be furnished by the manufacturers of the machine.



The Single Rear Wheel Enables This Motor Plow to Work within Six Inches of Trees

FLYERS MUST HAVE A LICENSE OR FACE ARREST

Complete regulation of flying above Los Angeles is undertaken by a new city ordinance which governs all kinds of aircraft and traffic. Dirigibles are required to give the right of way to free balloons, since the latter are unable to navigate a course. Pilots of all aircraft are required to take out licenses, and license numbers, three feet high, must be painted on the underside of airplane wings. Flying below 2,000 feet over the business district and 1,500 feet over residence district is prohibited; stunting and reckless flying are banned; passenger ships are required to be housed when not in use; night flying is forbidden without special permit, and inspection twice yearly, and after all accidents, is required.

SPARK PLUG WITH AIR INTAKE SUPPLIES ENGINE OXYGEN

An automobile spark plug with an air-intake tube running down the center and a valve arrangement that admits fresh air to the cylinder at each suction stroke has been placed on the market. The makers claim that the addition of fresh air to the mixture from the carburetor assists vaporization of the gasoline charge, retards oil pumping, equalizes compression, and helps keep the plug clean.

ONE-WHEEL-DRIVE MOTOR PLOW WORKS CLOSE TO TREES

Front wheels on a telescoping axle and a single corrugated driver of special design at the rear, are features of a fifteen-horsepower motor plow devised by a western inventor. It can be worked within six inches of trees, vegetable rows or fences, according to reports, and the drive wheel runs on the hard, even bottom of the furrow, a surface favorable to efficient traction, making the comparatively small motor practical. The front axle can be narrowed to a width of only thirty inches.

RUBBER-TIRED DOORSTOP SAVES MARRING OF FLOORS

A doorstop designed to hold the door in any position, without marking or marring the floors, works somewhat on the principle of a window catch, with an eccentrically mounted wheel faced with a rubber tire. When not in use, the wheel, equipped with a lever that can be operated with the foot, is kept clear of the floor as a result of its eccentric pivot, whereas in use, it is pushed down to establish a firm contact.

MOTOR-CAR TRUNK FOLDS AND FITS UNDER SEAT

Large enough to hold camping equipment or luggage, a trunk that fits on the automobile running board can be stowed away under the rear seat when not in use, as it collapses into a flat package. When opened, it is solidly braced, keeps out dust and dirt and is shaped to fit securely upon the board, where it is held by two clamp braces without the need of any straps, ropes or other means for keeping it from falling off. The trunk, which thus is always at hand, may be obtained in a large or small size and is claimed to be suitable for any automobile.

Open, This Auto Trunk Has Considerable Capacity, But Collapsed, It Fits under the Rear Seat

MYSTERY SEAPLANE PASSES SEVERE TESTS IN JAPAN

As in motor cars, there are changing styles in aircraft. A conspicuous example of this is a recent seaplane developed by Japanese builders. Details of its construction are being kept secret but new theories are said to have been applied in the design and operation, and the ship is reported to have successfully passed rigid official government tests under the eyes of experts. A noticeable feature is the curved rear part of the fuselage which rises to a much greater height above the water than in earlier similar types.

Elevating the Tail of This New Japanese Seaplane Insures the Rudder against Damage When Landing in the Water

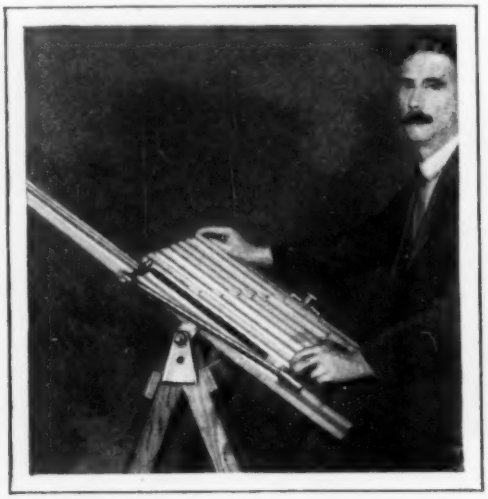
EPSOM-SALT VALLEY MINED TO AID TIRE INDUSTRY

A deposit of pure epsom salts, found a few years ago in the southern end of Death Valley, near Wingate pass, is being worked to supply the magnesium sulphate needed in manufacturing automobile tires. The epsom salts used in the tire plants make rubber casings wear longer. For a time after discovery, the deposit of pure salts remained valueless, since at that period the only customers for magnesium sulphate were the drug store and doctor, and there wasn't enough demand to make it worth while to pay the heavy transport cost necessary to bring it to market.

¶Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

MEASURING HEAT OF THE SUN TO AID WEATHER FORECASTS

By means of a special measuring apparatus which he has completed after years



Dr. Abbott with Instrument for Measuring Sun's Heat, to Aid in Forecasting Weather Conditions

of experimenting, Dr. Charles G. Abbott, of the Smithsonian institution, is reported to have found proof that the sun's heat varies from day to day and from year to year although atmospheric conditions may be identical. Scientific weather forecasts for longer periods may be possible as a result of these findings, it is believed, as they open a way to apply the factor of the sun's heat to future weather changes.

PLAN CONGESTION RELIEF WITH ARCADES IN BUILDINGS

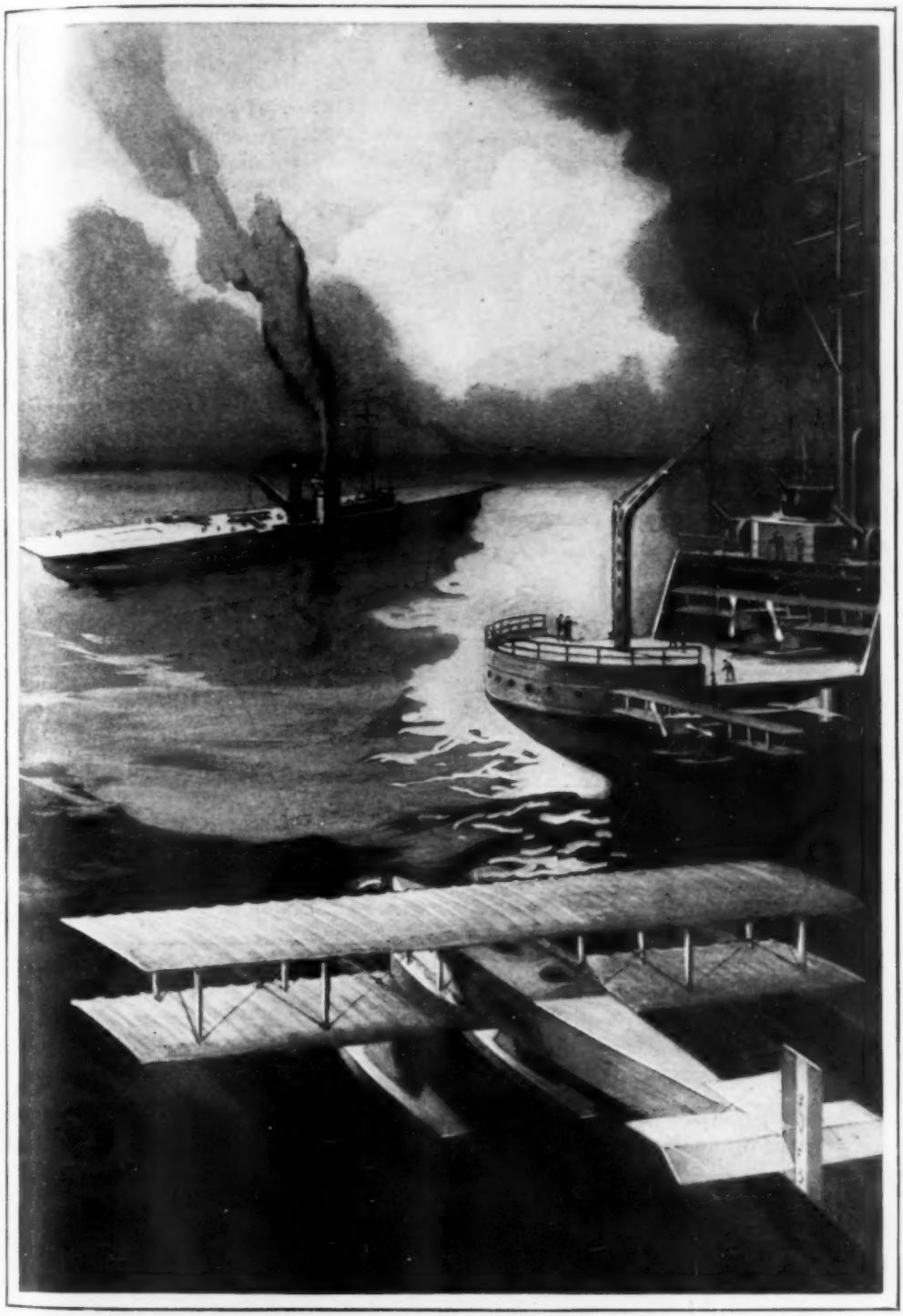
Cities can develop without curtailing the skyscraper by constructing arcades, underground garages and sidewalks cut under buildings, a New York traffic expert suggests. He points out that adequate provision for "horizontal transportation" is as necessary as the installation of elevators to care for "vertical transportation," and that the plan of raised sidewalks, reached by ramps or stairs, will not be popular as people prefer to walk around an elevation rather than climb. Arcades, he declares, already have proved practical in several cities here and abroad. They provide space for many stores, relieve sidewalk congestion and are sheltered from unpleasant weather. By installing them inside the building line, part of the present sidewalk could be removed for additional lanes of street traffic. A uniform plan followed throughout the city center would be necessary to achieve the desired results. Parking spaces for autos in the skyscraper basements and the erection of ten or twelve-story ramp garages would remove hundreds of cars from the streets, it is suggested, and limitation of parking to one side of one-way streets would expedite traffic fifty per cent. Recommendations are made that parking be prohibited between the hours of 8:00 a.m. and 9:00 p.m., and that freight terminals be established for trucking, so that long-distance hauls during the day could be avoided. Under this arrangement, merchandise would be transported from piers and railroad platforms at night, then distributed to the individual firms the next day. The suggestion is also made that apartments at reasonable rentals be erected near the business districts so that the workers could live within walking distance of their shops and offices. This would ease the burden on all traffic lines.

PENCIL HOLDER HAS BLADE ON END OF CLIP

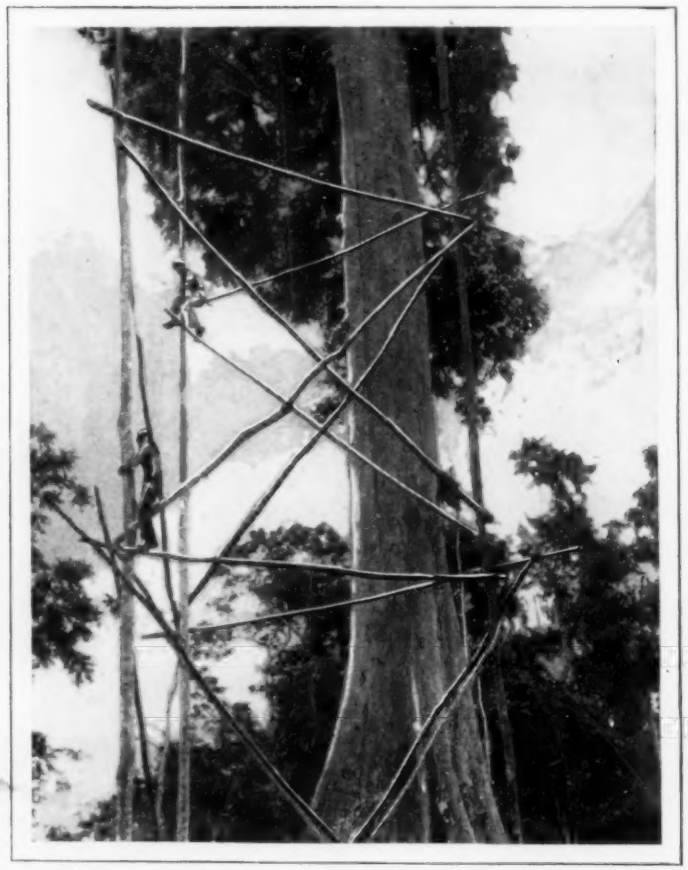
Pencil-holder clips that have a sharp steel extension blade, which can be used for almost any purpose where a small knife is needed, have been placed on the market. The projection lies flat so that it cannot tear the clothing and is ready for use as a knife by simply slipping the clip off or sliding it to the bottom.

ELECTRICITY KILLS PESTS

Successful tests at fighting destructive codling moths with electricity are reported from orchards and rose gardens in the northwest. Wires are strung through the trees and bushes, and a strong current, passed along for as brief a time as five minutes a day, is said to be effective in keeping the pests off.



Modern **Plane Carriers with Broad Landing Decks Are Supplemented by France in Her African Campaigns by Plane Transports like the One at the Right, Which Carry Large Numbers of Airships**



Surveyors Building a Tower around a Tree in a Philippine Jungle, in Order to Get a View across Country above the Forest

TOWERS HIGHER THAN TREES AID U. S. SURVEYORS

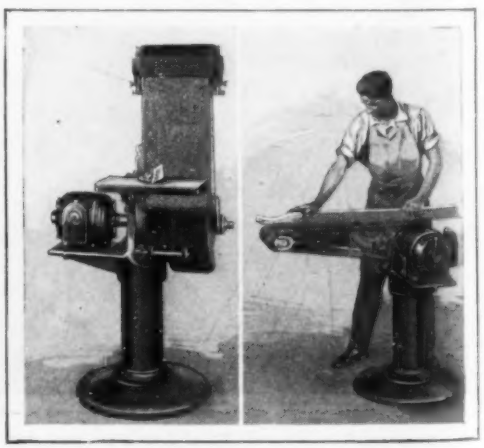
So that readings may be taken in spite of high trees, United States surveyors in the Philippines are often forced to construct towers higher than the jungle obstacles. Two independent structures of slender poles, one for the instruments and the other for the observer, so that his movements will not disturb the equipment, are built around the tree to afford views at great distances.

PRESENT BOBBED-HAIR FAD MANY CENTURIES OLD

Bobbed hair has joined the list of things that are not new, as a result of research by a French doctor who has listed three previous epidemics of feminine bobbing since the French revolution. The first followed immediately after the overthrow of the king, when women cut their locks in memory of Marie Antoinette, and others, who were shorn before being led to the guillotine. The fad revived in 1836, when the princess of Orleans exhibited her painting of Joan of Arc, showing the famous saint, as she is always pictured, with a bob. It was known as the Joan of Arc style. Short hair, resurrected again in 1871, was then called the Ninon style, in honor of the famous seventeenth century beauty.

TWIN-BELT SANDER SAVES LABOR

Vertical and horizontal sanding belts are combined in one in a motor-driven apparatus now on the market. Because of the duplex feature, it has a wide range of uses, being suitable for work on furniture, cutlery, hardware, toys, etc. It saves time and labor and produces uniform straight-grained finishes on flat or curved surfaces.



Sanding Machine Which May Be Operated Either as a Vertical or Horizontal Belt

CHANCE STILL AIDS INVENTORS IN THEIR WORK

Chance still plays its role in science. Two big discoveries of recent years both are due to pure chance. In one, chemists of a powder company, after working for months seeking a new quick-drying finish for various uses, had just poured some caustic soda into a preparation, when a breakdown of the machinery suspended experiments for several days. When the time came to resume and they looked at the old solution to see if a fresh one was needed, they were amazed to find the lacquer they wanted waiting for them. The accident solved the problem by leaving the mixture until the chemical did the rest. In an automobile laboratory, a chemist conceived the idea, during experiments aiming to solve the causes of motor knocking, that the color of the explosion might have something to do with it. He asked for some colored substance soluble in gasoline. As it happened, the only one available was iodine, and, while his color scheme was wrong, the use of the iodine resulted in the working out of the theory of anti-detonants, which may bring revolutionary changes in engine design.

CHART OF BIRTHS AND DEATHS SHOWS POPULATION GAIN

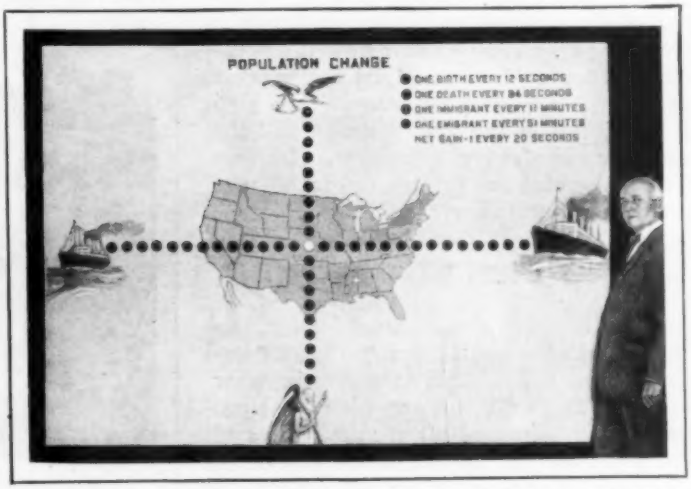
Vital statistics about America are presented in a novel flashing chart at the sesquicentennial exposition in Philadelphia. Lights go on and off to indicate births, deaths and the fluctuations in immigration and emigration. The net result of these factors, according to a summary on the map, is to give the country a net gain of one person for every period of about twenty seconds.

¶Names and addresses of manufacturers of articles described in this magazine will be furnished free by our Bureau of Information.

An Electric Blower That Dries the Bather Is the Latest Innovation for Swimmers

ELECTRIC BLOWER FOR BATHERS DRIES HAIR AND SUIT

Intended especially for use at indoor pools, an electric blower directs a strong current of heated air upon the bather at the turn of a switch, thoroughly drying hair, body and even the suit. The equipment is driven with power from the lighting circuit and can be moved about to any convenient place around the basin.


POPULATION CHANGE
ONE BIRTH EVERY 12 SECONDS
ONE DEATH EVERY 84 SECONDS
ONE IMMIGRANT EVERY 11 MINUTES
ONE EMIGRANT EVERY 51 MINUTES
NET GAIN-1 EVERY 20 SECONDS

Flashing Map That Shows Population Changes in United States; the Flickering Lights Record a Net Gain of One Person Each Twenty Seconds

Instructor Explaining to Young Recruit the Workings of the Parachute Attached to Dummy for Test

SECRETS OF PARACHUTE JUMPS TAUGHT AT SCHOOL

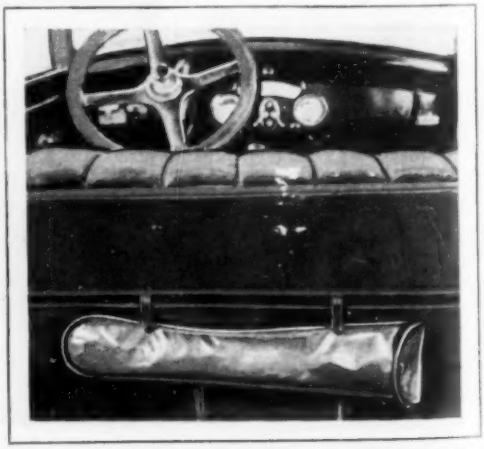
Before students are allowed to make parachute jumps, an instructor at the Lakehurst, N. J., training school familiarizes them with important details of the rigging, its construction, how it is released and opened, and other vital points. They are required to know how the parachute is folded, how to adjust the harness and are taught the correct way to step from the plane and just when to pull the ring that loosens the support. In first tests, dummies are often used to be sure that the apparatus will work as intended.

FORTUNES IN RABBITS

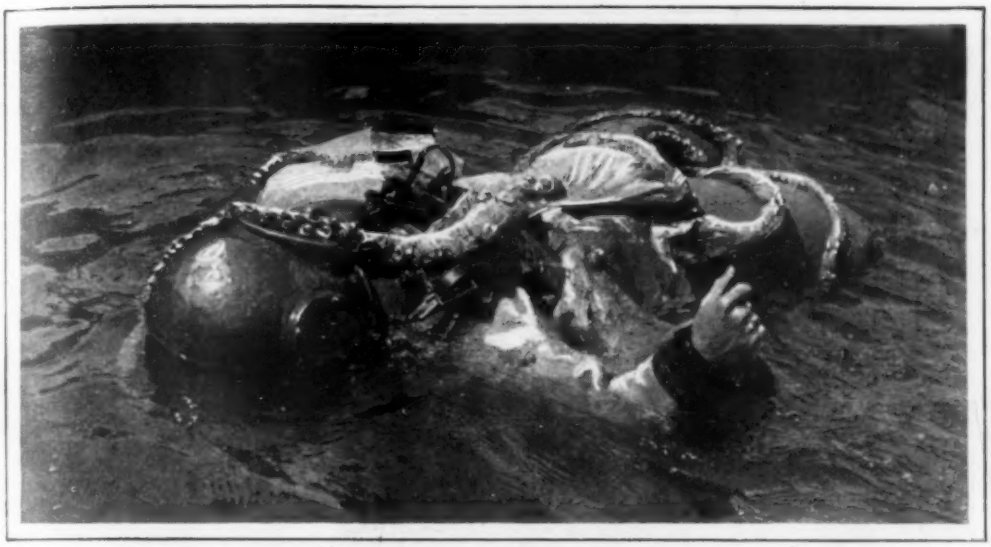
Largely due to the demand for fur, the raising of rabbits has become an important industry in Canada as well as in other countries. The skins are sheared, dyed and dressed out of all recognition, and the meat affords an additional source of revenue. The animals are not difficult to raise and breeders are giving their attention to the production of larger and finer varieties by judicious crossing. It has been said that about half of the fur now worn is rabbit. Successful imitations of mole, beaver, seal and chinchilla are made from the pelts after they have been treated. About forty are required to make a coat, two will produce a neckpiece and one is enough for a pair of gloves. One of the most popular varieties of rabbits is the chinchilla which has a strong resemblance to the genuine chinchilla of South America. Because of the small amount of capital necessary to start a rabbit farm, the industry is proving attractive to many persons.

UMBRELLA FOR AUTO ALSO FITS IN DESK

Collapsing into a small bundle that may be placed in a case on the back of the automobile seat, slipped into an office desk or tucked into a fair-size hand grip, an umbrella with a jointed handle is quickly raised or lowered and is said to afford as much protection as the standard-sized article. It is suitable for travelers, reducing the baggage by one unit, and school children can put it under the book strap. A tie keeps the ribs flat when the umbrella is closed.



Umbrella in Compact Carrying Case Attached to Back of Auto Seat; Tie Keeps Ribs Flat When Folded



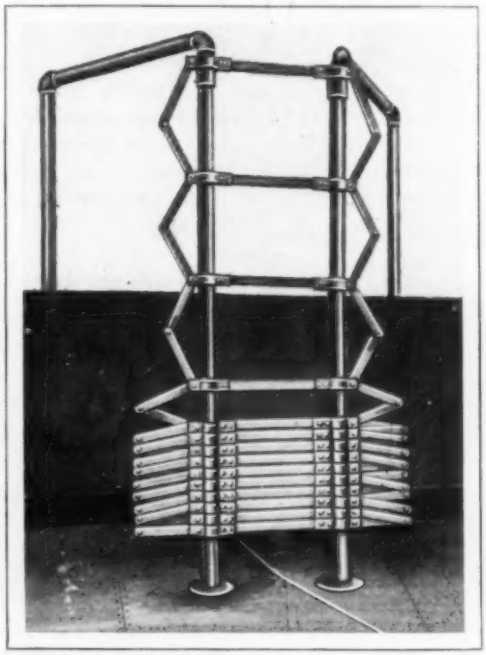
Madden in Diver's Suit, Struggling with the Octopus; Many of These Creatures Have Strength Enough to Trap a Man and Keep Him Submerged Although Their Prowess Has Been Exaggerated

MAN WRESTLES WITH OCTOPUS TO TEST ITS STRENGTH

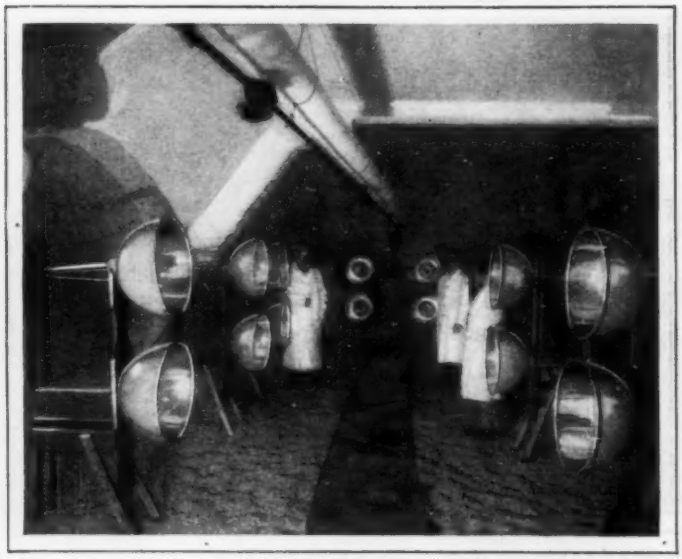
When James Madden caught an octopus in the ocean near Venice, Calif., he decided to test the strength and fighting ability of the creature. He obtained a diving suit and engaged in a wrestling match with his prize long enough to convince him that he was glad he had worn protecting armor, for the octopus displayed considerable power in its eight tentacles. Specimens with arms several feet long have been captured.

FLOATING TOP ON OIL TANKS TO PREVENT FIRES

Oil tanks with floating tops, that rise and fall with the liquid level and always exclude air from the surface, are being installed in many tank farms to end the disastrous fires, usually set by lightning, which annually cause losses averaging more than $15,000,000. The floating deck likewise practically stops evaporation, a loss that has been estimated as high as $150,000,000 yearly. The device was made possible by the invention of a floating basket arrangement that seals the space between the top itself and the walls of the tank, acting like piston rings in an automobile cylinder. The tanks are not perfect cylinders throughout their height, so that a rigid top would either become wedged in narrow spots or allow air to enter at others. To reach the floating deck a novel automatic ladder, folding like lazy tongs and sliding up or down on two pipes, which pass through guide sleeves in the tank deck, was devised.



Folding Ladder, Sliding on Rods, Gives Access to Floating Deck of Fireproof Oil Tank



Copyright, Henry Miller

Interior of Light-Bath Treatment Room, Showing the Arrangement of Lamps and the Sand-Sprinkled Floor to Resemble Beach

LIGHT-BATH TREATMENT ROOM RESEMBLES SEASHORE

Practically all the benefits of a sun bath on an ocean beach may be enjoyed in a special treatment room in Berlin, Germany. A battery of powerful lamps furnishes the health-giving rays which physicians declare are almost as helpful as those of nature, and the beach idea is further carried out by a liberal sprinkling of sand on the floor. An advantage of the establishment is that the amount of light can be regulated to suit the needs of each patron.

RADIO SIGNAL FADING WORST AT THREE HUNDRED MILES

Radio programs are received with greater clarity and volume 600 miles from the broadcasting station than at 300 miles and there is less fading at the longer distance. These are the conclusions of investigators for a naval research laboratory and an electrical company, who found that a zone 200 to 500 miles from the sending station is the poorest for radio reception. A satisfactory explanation of the phenomenon has not been advanced. It is classified in the category of vagaries of radio waves. Widely scattered volunteers assisted in making the tests, which were aimed at discovering the relation between weather conditions and radio. The connection of barometric pressure and temperature with wireless results is not definite, or if it is definite, it is so complex that it is not yet understood, the researchers declare. The signals are little affected by temperature although there is an increase of static in the summer. Tests so far show that the barometer makes little difference when transmitter and receiver are at the same pressure, but when transmission is from a high to a low-pressure area, it is best at short and long distances, but at medium distances of about 600 miles, it is best from an area of low pressure to one of high. The phenomenon apparently relates to the distribution of storm areas over the country. Some investigators have said that, if definite connection between radio and weather conditions could be established, forecasts could be issued as to the probable results of reception.

LAMP MAKES OWN ELECTRICITY AND BURNS UNDER WATER

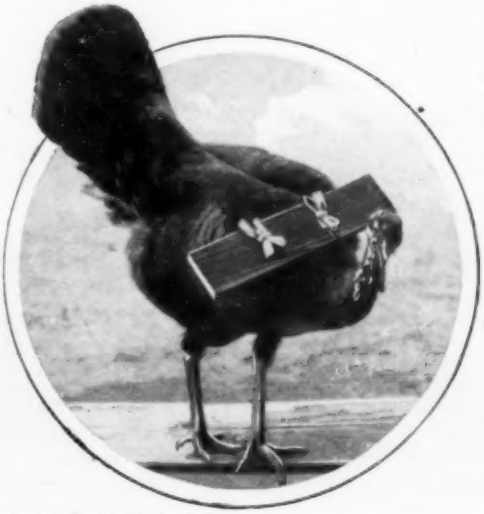
Batteries are not needed for an electric lantern intended especially for yachts and motorboats. Current is supplied from a generator of the magneto type, a spring mechanism being actuated by winding a crank at the side. The lamp has a handle and a shoulder strap, is not affected by dampness or water, and is said to burn indefinitely by the simple operation of giving the crank an occasional turn.

Where Your Turkey Comes From

By EARLE W. GAGE

THE demand for Thanksgiving and Christmas turkeys is so enormous that it is necessary to ship trainloads to our large cities. Vast ranches in the west are devoted to rearing hundreds of thousands of fowls, while giant incubating machines, the most perfect brooders, and modern scientific breeding methods are necessary to mother the delicate little turks through the perilous state of babyhood.

The first time that Thanksgiving day and the turkey were brought into intimate relation was in 1621, when Gov. Bradford, of Plymouth colony, set aside the first holiday to celebrate the ingathering of that first harvest — made by the sturdy Pilgrims who had come over in the "Mayflower" the year before. The harvest had saved the little colony, and incidental to the religious features of the occasion, the governor sent forth four men with their flintlock fowling pieces to procure meat to grace the festive board that the settlers "might, after a more special manner, rejoice together." Ever since the turkey has been the emblem of the day. When America was discovered and explored by white men, wild turkeys were found in large numbers from New England to Mexico. History shows also that turkeys had been raised in a domestic state by the Aztecs of Mexico at a still earlier period, and that they were introduced into Europe by white explorers and were highly prized as a table delicacy upon important occasions.



Courtesy Dept. of Agriculture

Unruly Turks Are Kept from Flying over Fences by Tying a Paddle above Wings

The onward march of civilization, the wider use of the motor car, and other

evidences of progress, all have tended to work to the disadvantage of the turkey which is now found only in a few sections of the country.

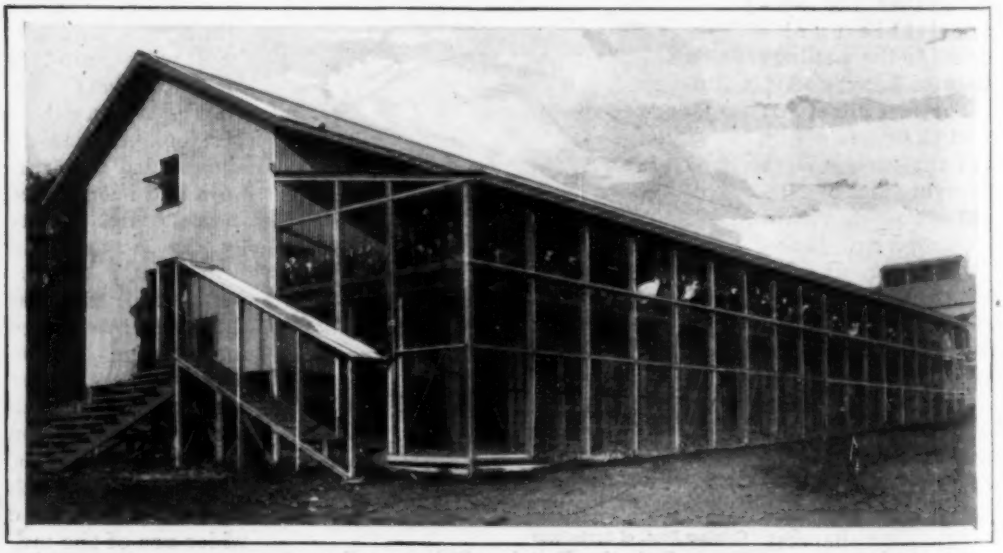
Because of the decreasing production of turkeys on farms, the business of raising them on a large scale has developed into an important and profitable industry. In the unsettled sections of the west, where the range is unlimited, and the natural food is abundant, flocks of turkeys are ranged much like sheep.

On a tract of land in the vicinity of the Mojave desert, a few miles from Los Angeles, a farmer turned loose several thousand young turks raised from wild-turkey eggs brought from Virginia. The coyotes, hawks and eagles spread the glad news and congregated to take a hand in the enterprise. However, the turkeys evinced their usual disposition to stray off and dogs were sent to find them and drive them back within bounds. In spite of the handicaps of nature, this ranch had 1,500 turkeys for market, and the birds had demonstrated their ability to thrive and multiply, when given plenty of room and liberty and surroundings natural to them.

Texas is the turkey state of the Union, producing one-tenth of our annual crop of festive fowls. The Lone Star state provides an abundance of range suitable for the fowls, flocks of several hundred being the common thing on many ranches. In the turkey-raising districts large dressing plants have been built, where thousands of birds are dressed, uniformly graded and packed in refrigerator cars for the trip to the consumer's table.

Just before the annual holidays of Thanksgiving and Christmas a turkey day is set aside. All who have turkeys to sell drive them to the central market, sometimes for twenty or thirty miles, the flocks consisting of as many as 8,000 or 10,000 fowl. Thirty men drove 8,000 turkeys thirteen miles in two days. In a drive of this kind, a wagon is driven just in front of the turkeys and a little corn is scattered to the leaders to keep them moving. Those that become lame or tired are placed in the wagon and hauled to town. At nightfall, provision is made to stop under a grove of trees where the turkeys may roost.

Cuero, Tex., "home of the famous turkey trot," and probably the largest shipping point for turkeys in the world, is the birthplace of a unique ceremony upon the last day of the turkey season. Just before the harvest festival rolls around, this community pays homage to its most famous and profitable crop and celebrates the end of the season with appropriate ceremonies. The turkey reigns as uncrowned king of the festival, and a parade is held.



Where Hundreds of Turkeys Are Prepared for Market, a Big Dressing Station in Texas; the Birds Are Uniformly Graded and Packed in Refrigerator Cars for Long Trips

INDIAN BOYS PLAYED MARBLES TWO THOUSAND YEARS AGO

Discovery of the skeleton of an Indian boy, about twelve years old, with a number of marbles, in a mound near Bainbridge, Ohio, indicates that the game was a favorite among the youths of the tribe as long as 2,000 years ago. The body had been interred in a log-cabin like structure covered with a canopy, of which molded fragments were found, and was clothed in a garment of woven fabric. Besides the marbles, other unusual relics were found, including stones carved to represent a turkey vulture and a lizard, beads, ceremonial specimens and other ornaments. The articles evidently had been placed with the body at the time of burial.

BATTERY TESTER DOESN'T DRIP AND REACHES HARD PLACES

Acid is prevented from dripping on carpets, clothing and floors by the sealed-bottom arrangement of a battery tester now on the market. It also has a two-foot flexible rubber tubing for reaching difficult places, such as batteries in autos, without removing them.

IDEA FOR BASEBALL CURVES GAINED FROM CLAMSHELLS

The irregular course of a half clamshell, carelessly tossed aside, gave William Arthur Cummings, the originator of the curve ball, the idea of applying the principle to the baseball sphere. Watching the shell, he became convinced that a ball might be made to perform similar movements if thrown in the right way. His friends laughed at his theories, but he demonstrated his skill while pitching for Harvard in 1867. Batters of the opposing team were astounded at the ball's sudden breaks, and Cummings was heralded as the "boy wonder" of baseball.

After Fireman Has Passed Through, the Trapdoors Automatically Close, Shutting Out Drafts

TRAPDOORS IN FIRE STATION SHIELD SLEEPING ROOMS

Unpleasant drafts, dirt and flies are kept out of the sleeping quarters in a fire-patrol station in Chicago by means of a double trapdoor at the opening around the pole down which the men slide when answering calls. Each leaf is closed, after the fireman has passed through, by an attachment like those on ordinary doors.

IMPROVED CLAMP FOR HOSE REDUCES LEAKS

For automobile and airplane hose, a clamp has been designed that is said to be practically proof against leaks.. An essential feature is a length of flexible cable which is wrapped one and one-half times around the hose, and exerts even pressure.

Walnuts Branded, the Stamper in Operation, and a Close View of the Rows of Cups That Hold the Nuts

BRANDING PRESS FOR WALNUTS STAMPS THIRTY A SECOND

In June, 1919, Popular Mechanics Magazine printed an announcement that the California walnut growers' association offered a prize of $10,000 for a machine which would put its brand on walnuts. The award has just been made to two Los Angeles inventors and, in addition, they will receive a royalty of $10,000, payable at the rate of $1,000 a year. More than 9,000 replies to the offer were received and 100 working models submitted. The winning device, resembling in some respects a printing press, stamps the nuts to the number of 2,016 a minute, which means the equivalent of a whole 30,000-pound carload in one day, at a cost of but one-twentieth of a cent per pound. The nuts are fed into a lower cylinder which has a row of little cups to hold them in place and they come in contact with an upper cylinder bearing small rubber stamps with the brand on them. Printers' ink is automatically supplied to the markers from a fountain above. Nearly three years were required to finish the model. An additional sum of $5,000 was paid to another inventor for an improvement in the feeding mechanism.

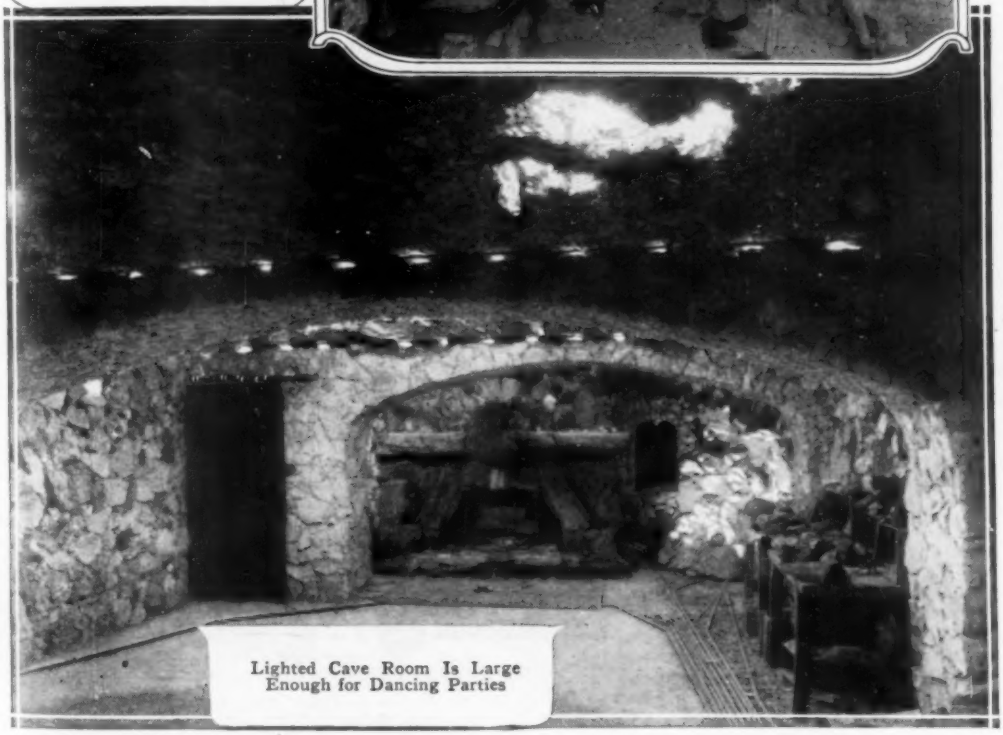
Double-Armed Phonograph Which Is Said to Produce Improved Tones and More Beautiful Resonance

TWIN TONEARMS ON PHONOGRAPH BETTER MUSIC

By introducing a certain interval between the tones as they are reproduced, a German musician has discovered that a more beautiful resonance and timbre are attained. Applying this theory to the phonograph, he has equipped the instrument with two tonearms, each with its membrane and needle, which run in the same groove a short distance apart. This distance is to be regulated to the speed of the disk and the tempo of the music, but, in general, a time interval of one-fifteenth to one-twentieth of a second has been found satisfactory and with radio reception, with headphones, much less. The aim of the device is not so much to increase the tone volume as to bring out overtones and attain greater sonority, or in the inventor's words, to produce something in music similar to the "stereoscopic effect" in photography. If one keeps the ear close to the machine, he can perceive the lack of synchronism in the reproduced tones, but at a distance of about three feet, the two tone waves have completely melted together without loss of the improved quality resulting from the arrangement.

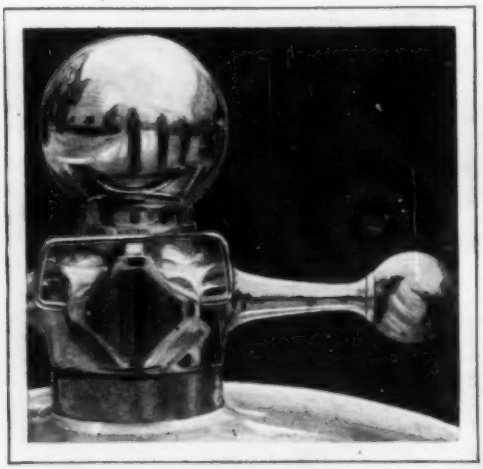
MAN-MADE CAVE ON BEACH RIVALS NATURE'S WORK

Exterior of Cave, Showing Skylights in Floor to Aid Illumination of Inside, and Views of Interior; Realistic Stalactites, Mossy Growths and Stones Collected from Distant Regions Increase the Natural Aspect of This Artificial Cavern for Picnic Parties; Electric Lights and Cooking Facilities Are Features



Lighted Cave Room Is Large Enough for Dancing Parties

AUTO ALARM HONKS WARNING WHEN MOTOR OVERHEATS

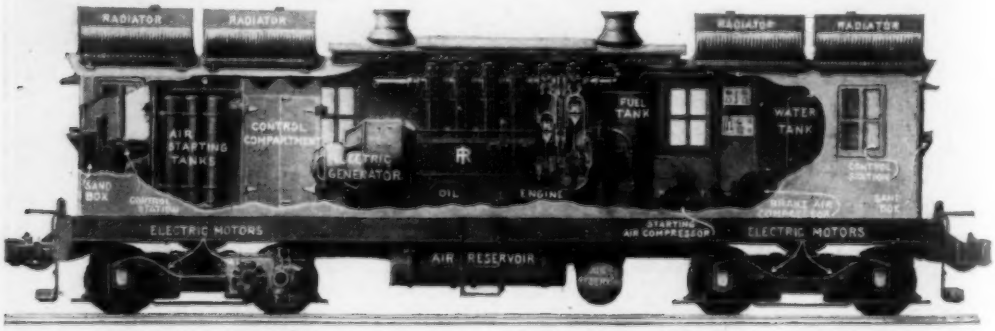


Auto-Radiator Cap with Thermostat Which Causes Horn to Blow When Motor Overheats

When the temperature of the motor reaches the danger point, a thermostat in the auto radiator cap closes an electric circuit and sounds the car's horn. The alarm may be stopped by turning a switch on the dash. The signal operates independently of water or steam in the radiator and is thus considered reliable in all cases. It may be adjusted to heat conditions of different cars and set to give the warning at any degree between 110 and 212 degrees Fahrenheit, or higher.

OIL-ELECTRIC ENGINE POWER HOUSE ON WHEELS

Introduced not many years ago, oil-electric locomotives already have been installed on eight great railroad systems and are said to have fully met the claims of their producers. In yard and switching work, for instance, one unit of this type can do the work of two steam engines, engineers declare. It is available eighty per cent of the time, as compared with the forty-per-cent availability of the old kind, costs about half as much to maintain and is operated at a fuel expense of from one-third to one-sixth that of the steam type. Experts estimate that in one year it will effect a saving of from $10,000 to $12,000 on switching and yard operations over an equivalent steam engine. Interesting features are included in these efficient power houses on wheels. They are independent of an outside transmission station for power and are ready to start on any railroad system without any change in either personnel or equipment. An oil-burning engine and a direct-current generator, which supplies electrical energy to traction motors mounted on the trucks, are the two principal units of its equipment. The engine is of the six-cylinder variable-speed type, having direct fuel injection. Cylinders, cylinder heads and combustion chambers are completely water-jacketed. Ignition is produced by the heat of compression only. Absence of smoke, cinders and a reduction of noise are other satisfactory features. The oil-electric engines have proved efficient in congested areas, and on long runs are especially serviceable since they require but little water. Fifteen-hundred-horsepower locomotives of this type are to appear in the near future, it is reported, and engineers are intently watching the effect of this form of locomotion on American railroading.



Oil-Electric Locomotive in Cross Section; There Is a Control Station at Either End; Less Noise, Absence of Smoke and Cinders and Economy Are Features Credited to These Engines

NEW AERIAL CAMERA PIERCES SMOKE

Far greater service from aerial photography is anticipated as the result of a faster exposure process developed by army experts at McCook field to be used with special plates manufactured for taking pictures from moving airplanes. It is expected that photos of entire cities can be taken at distances of 200 miles and from an altitude of 30,000 feet. Already clear views of mountains have been obtained at a distance of 150 miles in spite of smoke. The process is being kept secret for tactical reasons, but includes treatment of the plates with a chemical which hastens the effect of an exposure and makes them sensitive to infrared rays. When the plates are used in connection with a deep-red ray filter, the infrared rays and certain blues not affecting the ordinary plate are recorded. These are the rays, it is explained, that penetrate a smoke haze. Light fogs have been pierced, but heavy mists, as yet, prove a barrier partly because the rays are affected by the amount of vapor in the fog. It is expected that further experiments will remove this trouble. To test the new plates, photos were made of the Sierra Nevada mountains from a plane 150 miles away. On the old kind, only the immediate territory in the foreground was revealed, the rest being hidden by a smoke screen. But on the new plates, the distant ranges were plainly visible, although they could not be seen at the time by the photographer.

CLOTH WOVEN FROM BAMBOO

Bamboo is being utilized for textiles through a patented process developed in England. The stalks are first shredded in such a way that the long fibers can be spun or woven as readily as cotton or flax, and at less expense according to reports. Bamboo abounds in many tropical countries, so that raw material is plentiful.

One Nerve Center of New York City: Telephone Headquarters Building from Which 120,000 Phones Are Operated

BIG PHONE EXCHANGE REQUIRES SIX THOUSAND WORKERS

Constructed in the "stepped-in" style of modern architecture, that has become increasingly employed in our larger cities for the sake of light and air, the huge telephone building in New York city, the nerve center of Manhattan, houses some 6,000 workers who are kept busy operating 120,000 telephones. The size of the structure is emphasized by the comparatively small buildings near the site, which is on the lower west side.

Fighting

By F. A. ZEUSLER

Lieutenant Commander, U. S. Coast Guard

DERELICTS—the ghostly objects that were once ships and are now neither afloat nor sunk—objects that drift with the winds and currents over the seven seas, are one of the greatest dangers to the navigator, even as great as the iceberg. The berg is usually much larger and is more apt to tear the bottom out of the ship that may run onto it, but it can usually be seen by an alert lookout except on dark nights and during foggy weather and is rarely found outside of rather clearly defined ocean areas.

The derelict, however, may be dismasted, it may be so low in the water that even the best of lookouts would fail to see it until dangerously close. It gives no warning of its presence, and may be floating in any of the oceans from the South seas to the Arctic and from the China sea to the Mediterranean. It is here today and gone tomorrow. As if animated by some restless spirit, it wanders over the ocean impelled by wind, wave and current.

The United States government has designated one of its agencies, the coast guard, to hunt down and send to rest the uneasy remains of what once were ships in order that other ships may live. The seagoing cutters of that service, in addition to the duty of enforcing the maritime, navigation and custom laws, devote the greatest part of their time to assisting vessels in distress and to clearing the seas of dangers to navigation.

Information as to the location of derelicts is received from various sources, principally from the captains and officers of the great ocean liners and freight carriers of the world. Upon sighting a derelict, these officers immediately transmit by radio the information to the coast guard. One of the cutters of the service, the "Modoc," "Snohomish" or the "Seneca," immediately starts out on a hunt for it to tow it into port or to send it to the bottom by means of high explosives.

The success of the search depends upon a number of factors, chiefly the accuracy of the original report, the time elapsed since last seen and the weather conditions. Experience has evolved certain rules to follow, so that the hunt is by no means a haphazard operation. The commanding officer of the cutter, with the information given by the captain of the merchant vessel and his knowledge of ocean currents, estimates how far and in what direction the derelict will drift during the time it takes the cutter to reach its position. Often, upon reaching the calculated position, the derelict is not found, as a sudden

Derelicts

Waterlogged and Dismasted, This Lumber-Loaded Schooner, Found Wandering the Seas, Was Towed to Port by Coast Guardsmen to Remove Its Menace; at Left, Preparing to Destroy a Derelict Barge

storm or shift of wind may have caused it to take another direction and then an extended search must be made.

When this is necessary, the hunt is commenced from the calculated position and by a series of zigzag or rectangular courses, the cutter covers a large area, continuing, until the wreck has been found, for as much as ten days or two weeks, maintaining position at night, during foggy weather and on days of low visibility but steaming full speed during all clear weather. Often the cutter travels on courses similar to the lines of a huge spiderweb, increasing and decreasing the distance between lines of travel, according to the clearness of the atmosphere. Men are stationed aloft in the crow's-nest with powerful telescopes. All floating objects are reported by them. Passing vessels are communicated with. The "thousand eyes" of these merchant vessels are a great help in this game of hide and seek.

The derelict may be an abandoned steamer, a lumber or a fishing schooner or some other craft. Its condition varies from one waterlogged and awash to one intact in all respects, such as the mystery ships occasionally found off the Atlantic coast. One such ship was a coal schooner adrift in the Gulf stream, all sails set but flapping and the decks all in order. The schooner's boat was astern. The cabin and men's quarters were neat and in order, a clock was ticking on the mantel, the breakfast dishes were on the table, but nary a sign of the crew.

Derelicts have been reported by vessels which, when found by the cutters, have had people on board. An instance of this occurred some years ago in the track of the transatlantic liners, when a derelict was reported by a passing vessel. A cutter was dispatched to the locality and after a search of a week found, not a derelict, but an American fishing schooner with eighteen men on board. The vessel had encountered a series of storms, losing her masts and most of her sails. She was six weeks overdue at her home port, struggling to travel 300 miles to the nearest land with only one sail and a stump of a mast as motive power, fighting storm after storm in the dead of winter. The men and their schooner were taken home and great was the rejoicing of the fishermen's families who had given them up for lost.

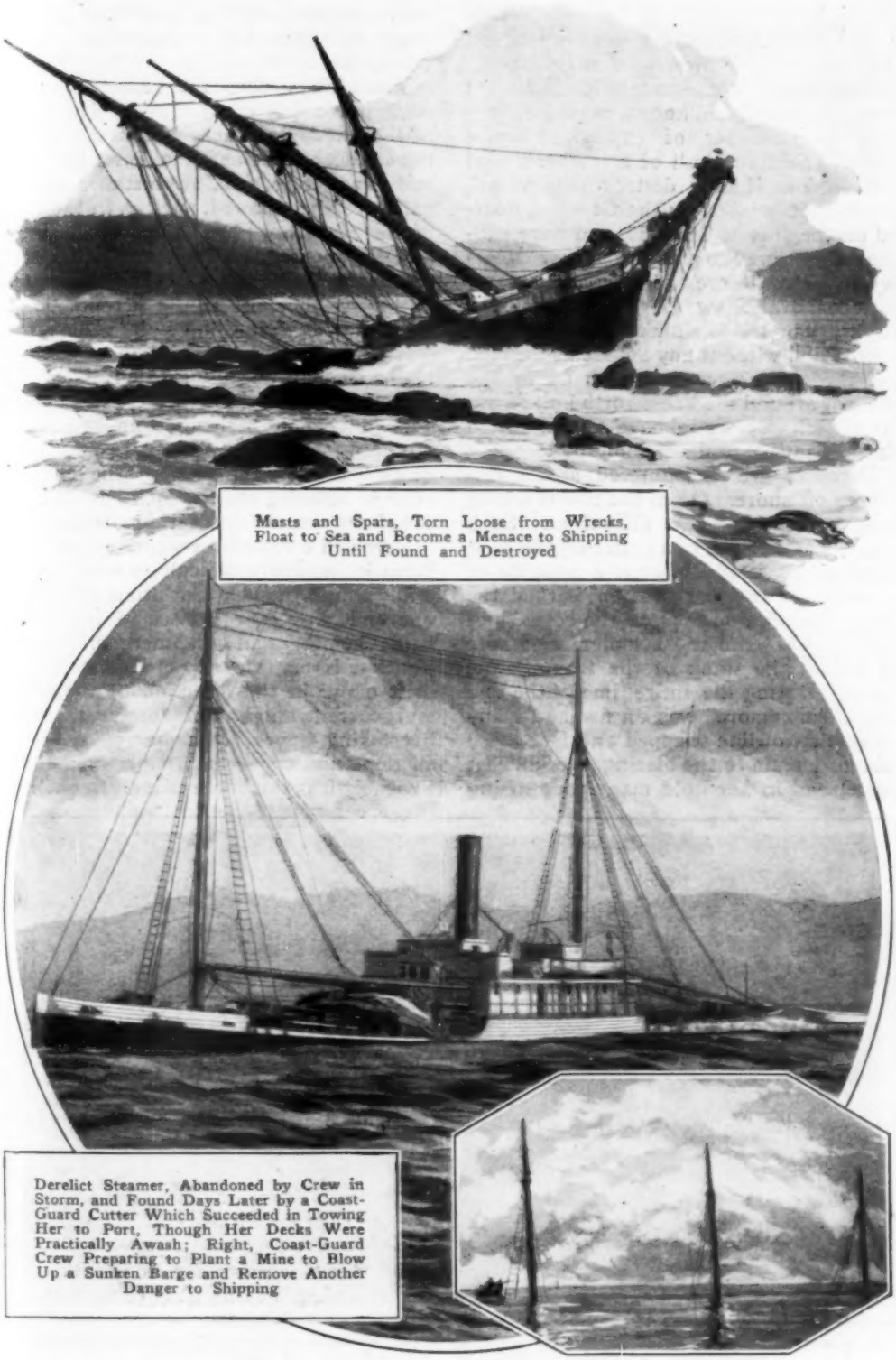
The speed of the derelict is governed largely by the ocean currents, the wind also having some effect. Some have been known to travel at the rate of about two and one-half knots, while one derelict, picked up by the cutter "Seneca," had drifted 285 miles in four days. Derelicts

Preparing to Mine a Derelict; the Detonator, Top, Is Being Inserted in a 1,500-Pound Mine in the Center; Below Is the Cable and a Small Mine

which have been abandoned off our Atlantic coast generally drift along with the Gulf stream and, if not removed in time, gradually find their way into the track of the transatlantic liners, going toward Europe. A recent case is that of the "Governor G. W. Parr," which was abandoned off our northeastern coast and, when last seen, had crossed the ocean and was off the coast of Africa, having passed through the steamer lanes, sighted a number of times, picked up twice by cutters to be towed to port but lost again in the severe winter gales off the Grand Banks, only to continue merrily on its original journey. According to one theory, when a derelict reaches the eastern portion of the transatlantic lanes, it jumps off the edge of the lanes and drifts to the southward and eventually reaches the Sargasso sea, that large tract of comparatively still water in the North Atlantic ocean, so named from the floating seaweed found there. It is supposed to lie between the parallels twenty and thirty-five north and meridians thirty and seventy west, an area seldom traversed by shipping. It is believed by some that once reaching this lonely area, the derelict gradually breaks to pieces from the buffeting it receives from the storms.

Whenever the derelict hunter comes up with his quarry, he must decide whether it is to be towed to shore and beached or destroyed where it is found. The value of the vessel and the cargo, the distance to shore, the state of the weather and the conditions of the hull all enter into consideration in deciding this. The policy of the coast guard is to save all property, if possible, and it rarely destroys a derelict if there is the least chance of saving it. The commanding officer of the cutter makes a thorough examination of the situation, and if he finds that the derelict is in condition to stand towing, he will take it to the nearest port.

Vessels laden with lumber or other valuable buoyant cargo will be towed to port, not only because their owners should have a chance to recover the property, but another good and sufficient reason is that it is almost impossible to de-



Masts and Spars, Torn Loose from Wrecks, Float to Sea and Become a Menace to Shipping Until Found and Destroyed

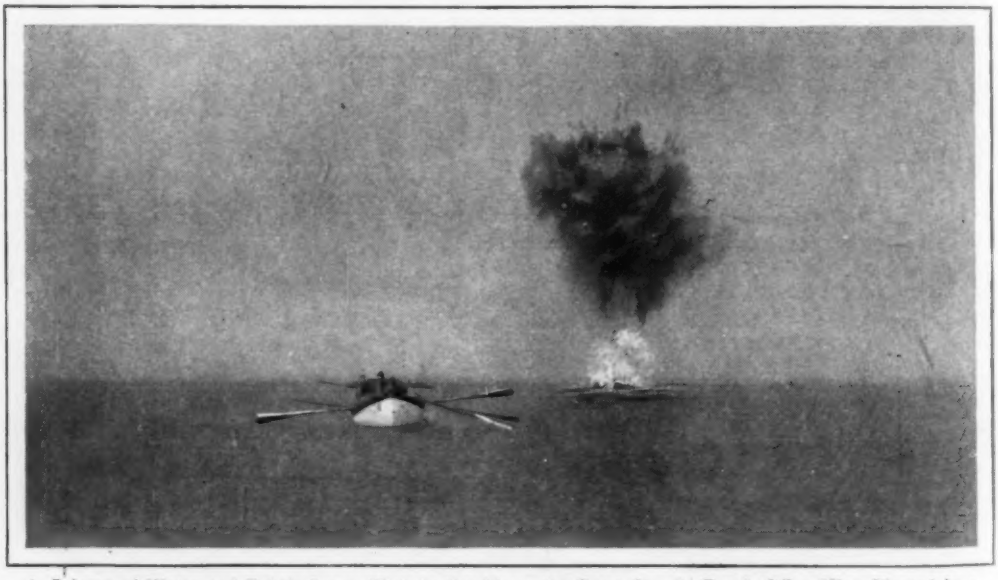
Derelict Steamer, Abandoned by Crew in Storm, and Found Days Later by a Coast-Guard Cutter Which Succeeded in Towing Her to Port, Though Her Decks Were Practically Awash; Right, Coast-Guard Crew Preparing to Plant a Mine to Blow Up a Sunken Barge and Remove Another Danger to Shipping

stroy a vessel loaded with lumber. When, in 1918, German submarines visited our Atlantic coast to prey upon our shipping, the submarine commanders learned what the coast guard had known years before—that any number of explosive bombs placed about the hull of a lumber vessel will seldom if ever destroy that vessel. Such craft bombed by the Germans floated on the seas as derelicts, and were subsequently towed to port by cutters. Nearly ten years before the war, a cutter off the coast of New York had exploded twenty-four mines simultaneously around such a hull without any appreciable effect, yet those same mines, blown up in like manner around the Woolworth building in New York city, would have caused untold damage to that and adjoining buildings.

Derelicts are encountered at all distances off shore. Often the tow is a long drag presenting great difficulties. Such was the experience of a cutter off the New England coast which, after a struggle of a week, towed into Boston harbor the largest derelict on record—the remains of the British steamer "Templemore," afire at sea in the track of the transatlantic liners. During the entire time of the tow the "Templemore" was on fire and many times the towline snapped and had to be fastened again to the blazing wreck. That vessel had in her hold many tons of pig copper which melted as a result of the intense heat, but which was subsequently salvaged.

Not always does the rescuing vessel reach port safely with her prize. The strain of the tow and the seas will often weaken the derelict sufficiently to burst the hull and cause it to sink. Sometimes strong gales are encountered, such as in the case of the "Governor Parr" which broke adrift and disappeared. A few years ago a cutter on the Maine coast had the experience of having the hull of the derelict barge it was towing burst and sink. The barge was loaded with cotton wood, which, being extremely porous, swelled and burst the hull, spilling the entire cargo of logs. The hull went to the bottom in several hundred feet of water and it was only the quick work on the part of the cutter's crew in severing the ten-inch hawser that saved the vessel from serious damage.

Derelicts often turn bottom up, making them increasingly difficult to tow. Generally a hull in such a position will show one end above the surface of the water while the other end is submerged. In this position is may be expected that it will drift along in the direction of the wind and current, high end foremost. The overtaking waves break over it, giving it an impetus that seems almost incredible. Probably it is this force that so frequently



A Column of Water and Debris Leaps High in the Air as the Coast Guards Touch Off a Mine Planted in a Sunken Ship; the Work Is Attended by Constant Danger and Plenty of Thrills

drives derelicts apparently counter to either the wind or current. In finding a derelict bottom up, the guardsmen climb up on the bottom and fasten a huge iron strap with an eye in one end to the keel. To this is fastened the towline. Upon nearing shore, the deepest water must be sought or the downward-pointing masts will strike against the sea bottom and block traffic until the prize can be turned right side up or the masts cut.

If it is impracticable to tow the derelict into port, the cutter will destroy it with mines. The type of explosive generally used is TNT and comes in two sizes, one a fifty-two-pound mine and the other of approximately 150 pounds. Several of these mines are placed in the cutter's boat for transportation to the derelict and planting. They are placed about the hull of the vessel, and when connected, the last mine is spliced to the mining cable, which the boat pays out from a reel as it pulls away from the wreck. When it is a safe distance away, the crew connects the ends of the cable to the firing battery in the boat, and explodes all the mines simultaneously. Not often, however, is destruction accomplished by one explosion, but it frequently happens that the operation must be repeated many times. When the destruction is completed, the cutter takes soundings of the sea bottom very carefully in the vicinity to be assured that the depth of water is ample for all ships to pass over the sunken remains.

The disposition of floating wreckage, such as rafts, trees, spars, logs of timber and parts of ships' hulls depends upon their nature and distance from the nearest available place to beach them. Ordinarily their destruction is accomplished by the use of wrecking mines, but, when possible, the spars or balks are dismantled and hoisted aboard or towed to the beach. Wreckage attached to the bottom is either hauled clear by a hawser or set loose by a mine.

In many instances cutters have disposed of derelicts by gun fire, among them the "Louisiana" which broke in two off the capes of the Delaware.

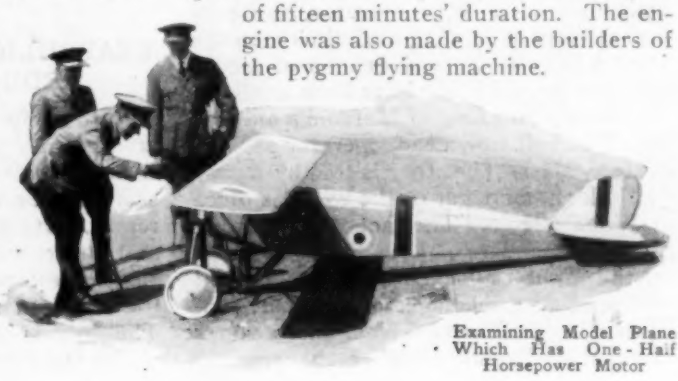
Elaborate Table Top of Wood and Metal Odds and Ends; It Contains 3,000 Pieces

THREE-THOUSAND-PIECE TABLE MADE OF WOOD AND METAL

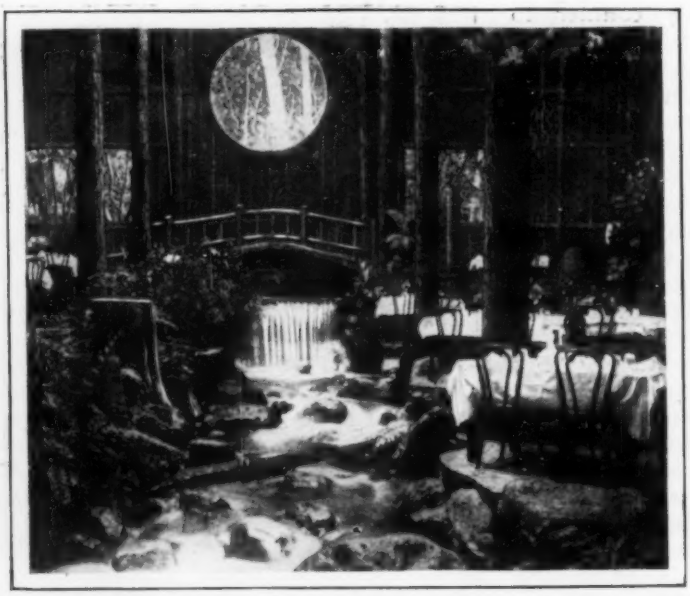
Using such odds and ends as soup bones and bits of silver and gold, an eastern craftsman has fashioned an inlaid table containing 3,000 pieces. The work required about a year to complete.

MODEL PLANE RUN BY MOTOR FLIES FIFTEEN MINUTES

Model airplanes are being constructed more and more like the real ones. This is shown in a tiny craft of English construction, fitted with a one-half-horsepower motor and capable of making flights of fifteen minutes' duration. The engine was also made by the builders of the pygmy flying machine.



Examining Model Plane Which Has One-Half Horsepower Motor



Where a Restaurant Is Built over a Woodland Stream; the Rivulet Runs through Center of Room; Tables on Natural Rock Floor

RUNNING BROOK IN RESTAURANT HELPS COOL INTERIOR

Diners in a California resort can enjoy a mountain atmosphere even while inside, for a brook runs through the room, creating a pleasing effect as it tumbles over a low ledge. The tables are set on the flat rocks which form the natural floor.

FIRST TEST OF WIRELESS AIDED BY RELAY OPERATOR

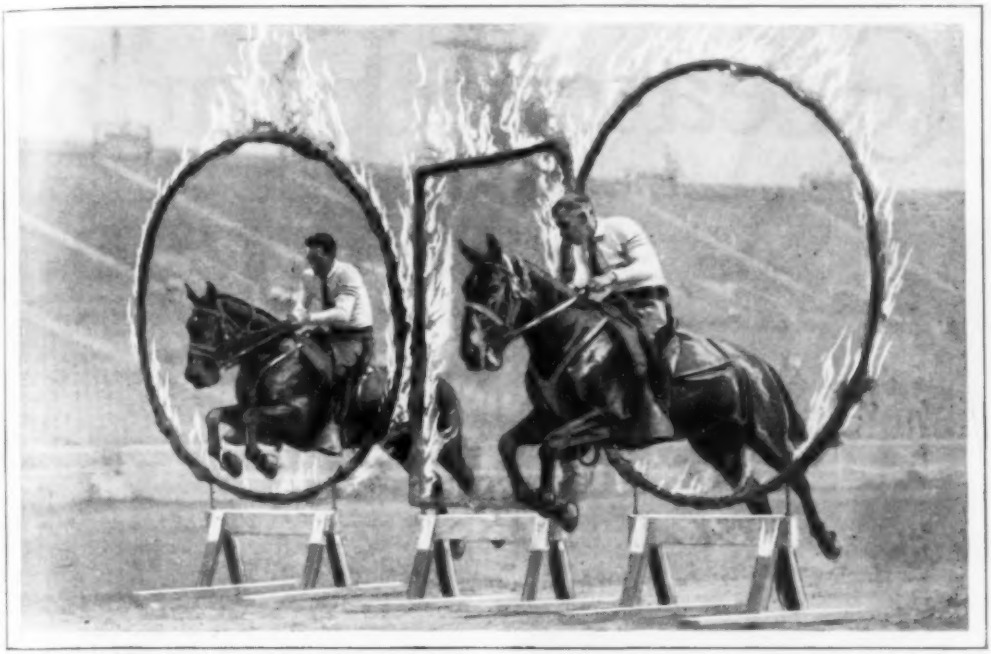
Volunteer radio operators, the amateurs with small sets installed chiefly for amusement, have rendered valuable aid to the larger stations on many occasions, and now it is learned that, but for the timely assistance of a relay operator, the very first attempt at sending a wireless message from a ship to shore, a quarter of a century ago, would likely have been a failure. The man who came to Marconi's aid was Jack Mitchell, now dead, operator at Siasconsett, Mass. The story is told by Henry G. Haddon, manager of the wireless office at Wood's Hole. The facts are recorded in the office diary. The test was made on the night of Aug. 16, 1901. Marconi was sending a message to President McKinley at Washington from the steamer "Lucani." Papers all over the country were eagerly awaiting the result, but not one of them recorded the fact that, before the dispatch was completed, Marconi's sending outfit broke down. Mr. Haddon tells the story as follows: "When the break came, Jack Mitchell messaged me, 'Cut off Washington for a minute and we'll finish the message.' It looked as though the first radiogram had about forty words still to go. In a few minutes, he sent me the conclusion, signed Guglielmo Marconi. Within an hour, we were relaying the president's reply to Marconi. Meanwhile, the apparatus had been repaired and the rest of Marconi's message was coming through. Except for differences in a few words, the two conclusions were identical. The bona-fide ending stopped with me."

RUBBER OVERSOLES FOR SHOES CARRIED IN POCKET

For both men's and women's shoes, an elastic rubber sole fits snugly at front and back and is so small that a pair may easily be carried in the pocket or vanity case. A feature is the grip for the heel which keeps the rubber from slipping off.

SEARCHLIGHT ON HOTEL ROOF REDUCES AUTO THEFT

Auto thefts in an eastern city have decreased fifty per cent largely due to the installation of a 43,000,000-candlepower searchlight on the roof of a hotel, officials report. Its flashing announces a theft, and police, seeing the light, go at once to the nearest patrol box where they learn the details of the crime from headquarters. The light is then directed on the section where the car was stolen.



By Careful Training, Horses Can Be Taught to Overcome Their Natural Fear of Fire to a Remarkable Degree; These Police Mounts Plunged Willingly through Blazing Hoops at Exhibition Drill

HORSES JUMP THROUGH FIRE AT RIDING MEET

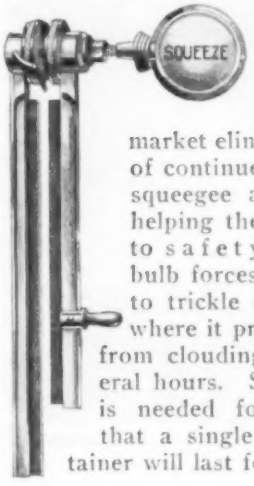
Leaps through flaming hoops featured the performances of horses and riders at an exhibition police meet at the sesquicentennial exposition. The animals displayed no fear of the fire shooting from oil-soaked wrapping around the frames which were supported on low hurdles. A rectangular piece between them, also ignited, made the effect more spectacular.

PLANE PUSHED BY PROPELLERS LESS DANGEROUS IN FALL

With two motors between the wings at the sides and back of the pilot and his companion, an airplane that is expected to prove less hazardous in case of falling has been designed. In the usual craft, the power plant and the propeller in front often are forced back upon the pilot in a crash, injuring or killing him. In the new style, the motors are placed to make nose-dives less likely, as the propellers push the plane. There is less noise to the passengers as well as less dirt and an unobstructed view ahead. The design also permits construction of a plane with a blunt metal nose intended to help prevent serious damage in case of a fall. The ship is to have both land and water alighting gears, of which the former will have a brake so that the plane is expected to land or take off in twice its own length.

FLUID IN WINDSHIELD WIPER HELPS CLEAN GLASS

Fitted with a small bulb which contains a fluid that is said to keep rain and mist from obscuring the view through the automobile windshield, a wiper now on the market eliminates the necessity of continued movement of the squeegee arm by hand, thus helping the driver and adding to safety. Pressure on the bulb forces some of the liquid to trickle down on the glass, where it prevents rain and fog from clouding the view for several hours. So little of the fluid is needed for each application that a single filling of the container will last for weeks.



Greatest Feat of Mexico's

View of Construction Line

By JOHN

AMONG the great railway-building enterprises this world has seen few if any are more audacious of conception, or fraught with more romance and adventure during the period of construction than the line which will open the west coast of Mexico to the commerce of the world. It will establish the first direct rail service between Mexico City and the American Pacific coast, and will put Los Angeles commercially nearer to Mexico City than it now is to Chicago.

The west coast of Mexico comprises a strip of territory approximately 1,200 miles long, where the average width across the coastal plain is about 130 miles from the beaches to the mountains. Fifteen huge rivers flow down from the mountains through valleys which, for agricultural productivity, are as rich as the famous valleys of the Nile, the Tigris and the Euphrates. This vast region, including the states of Sonora, Sinaloa and Nayarit, or an area equivalent to four American commonwealths the size of Indiana, is the richest part of the entire Mexican republic. Geographically, however, this great storehouse of untouched Mexican resources has been so isolated from the rest of the republic as to be a part of it almost in name only. Bounded by the United States on the north, by practically impassable mountain ranges on the east and south, and by an ocean with no commercially advantageous harbors on the west, that coast of Mexico has long been a sort of "no man's land" as a figure in world commerce. In spite of its enormous resources of agricultural production, minerals, fisheries, forests and power sites for

Railroading Taps Treasures

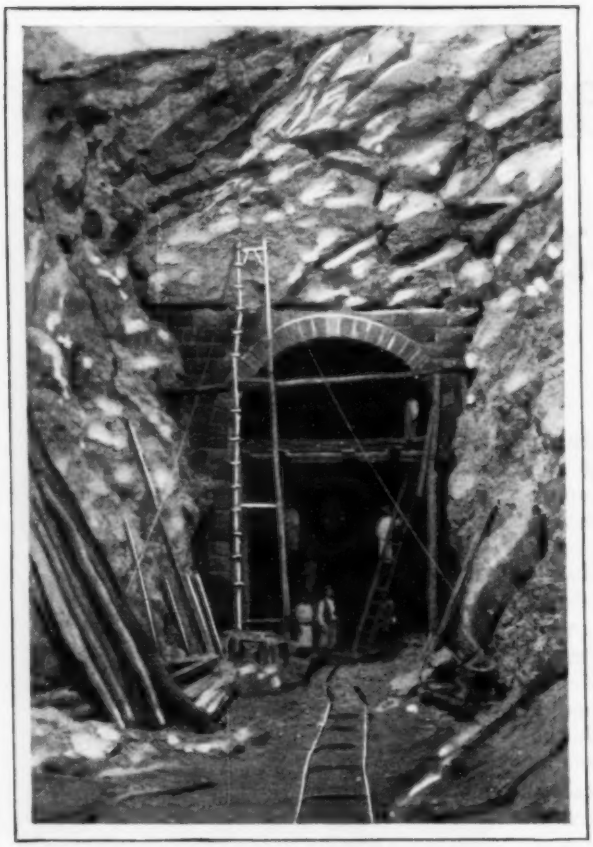
E. HOAG

hydroelectric development to stimulate manufacturing, the region has long lain dormant largely because it had no route of commerce to or from domestic or foreign markets.

More than two decades ago E. H. Harriman, the great American railroad builder, with the vision that characterized his monumental undertakings in the United States, discerned the commercial future of the west coast of Mexico. He visualized a western line of rails, connecting with the railroads of the United States on the Pacific coast, extending down into Mexico. Although he never lived to see his dream realized, the work was well under way, and part of the line in operation before he died. The tale is told that upon his death bed his interest in the enterprise was still so great that he had a map of the route painted upon the ceiling in order that he might study it, and direct the work.

After Mr. Harriman's death the work of completing the Southern Pacific of Mexico passed to another great American railroad builder, Mr. Epes Randolph. The years he spent attempting to carry it to completion were fraught with obstacles that would have caused a weaker spirit to give up in despair. The engineering difficulties of building the road taxed the best brains that money could hire. And, as if that were not enough to defeat the plan, then came the long years of revolution in Mexico. While Randolph was trying to build his road, one group of revolutionists after another were dynamiting bridges, burning stations, and tearing out miles of rails faster than any army of men could put them down. The work sta-

One of the Thirty-One Tunnels



Tunnel Entrance on Miravelles River Section of Southern Pacific of Mexico; Masonry Is of Permanent Construction

nated. The discouragements were such that the entire project would undoubtedly have been abandoned but for Randolph's refusal to give up.

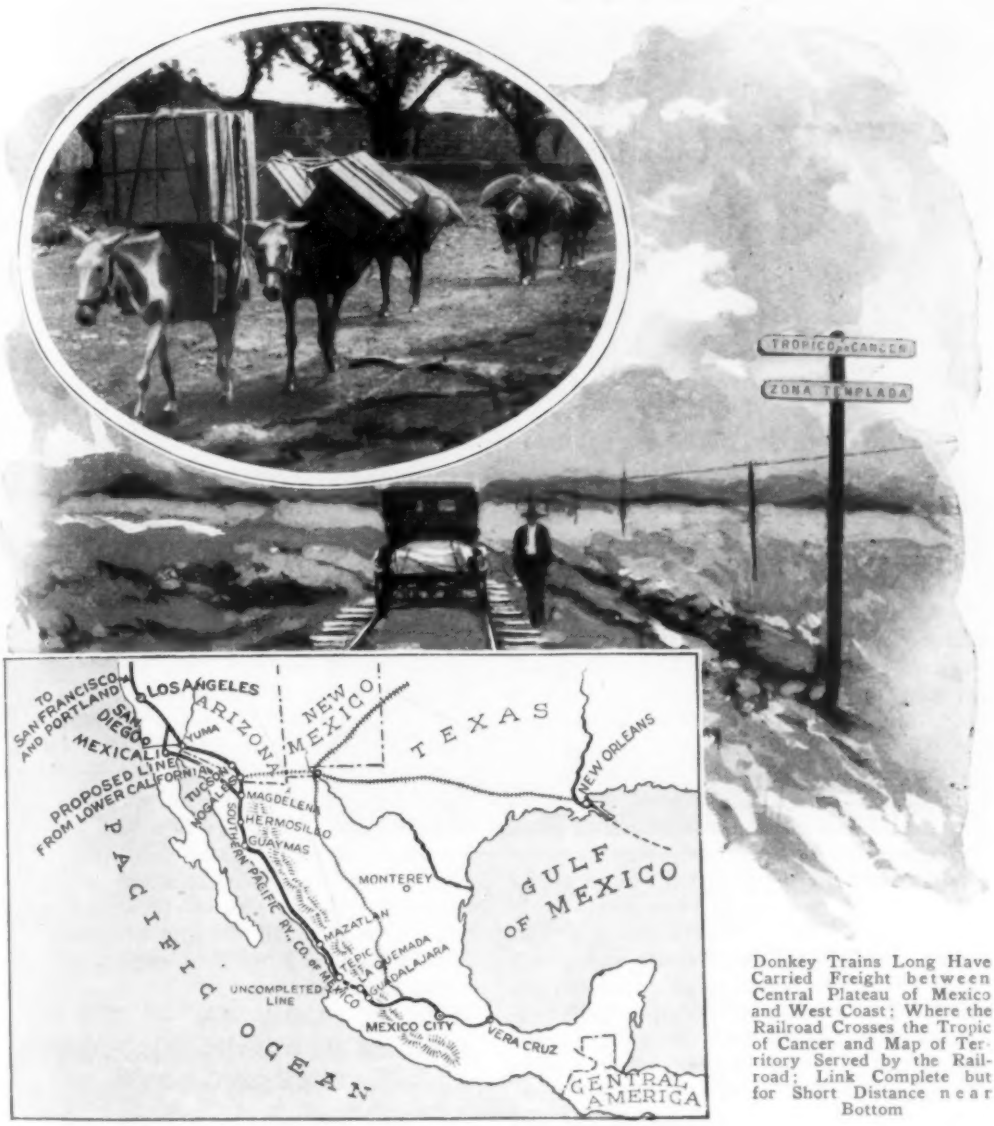
Like Harriman, Randolph never lived to see the work completed. He is said to have died imploring his associates to carry on—and out of respect to him, and to Harriman, the road has been pushed ever since; halted only during the waning revolutionary periods of more recent years. With order and stable government established in Mexico since 1923, construction of the line has been steadily pushed ahead. Trains have been in regular service from Nogales, Ariz., over 931 miles of completed line through the states of Sonora, Sinaloa and Nayarit, to the city of Tepic, the capital of the latter Mexican state. Meanwhile a gap of 103 miles through the mountains between Tepic and La Quemada in the state of Jalisco has been the scene of spectacular, difficult and costly road building through which trains will soon be in operation. These 103 miles through the very backbone of the Mexican continental divide will form the connecting link between the rich west coast of the republic and the central-plateau region, where most of the great cities and approximately seventy per cent of the total population of Mexico are concentrated.

The region in the states of Nayarit and Jalisco where construction work is now being pushed to completion is what the Mexicans call "barranca" country. There is no exact English equivalent for this Spanish word, but if we translate it to mean pinnacles, or land so rugged that the word mountainous falls short as a descriptive adjective, we have at least some idea of what the country is like. We may marvel at such engineering feats as the Panama canal, but down here in Mexico we find a piece of work that literally staggers the imagination. It is the task of engineering a railroad through more than a hundred miles of country where it would seem almost ridiculous to attempt the engineering of a trail over which a herd of goats might be driven.

Engineers tell how, day after day, parties of men went out fighting their way through the barrancas on foot. Sometimes they were able to move only three or four miles. Their clothing was torn to shreds in the heavy brush, and often, after surveying many a painful mile, they would find themselves in blind canyons where the carrying through of a railroad seemed impossible. Even after the route was finally located, not a spadeful of earth could be moved until hundreds of miles of trails for the pack animals had been completed.

Obviously, railroad building through such country is an endless series of tunnels, bridges, cuts and fills.

The volcanic origin of the country further complicated the problem. Some of the lava formations through which the

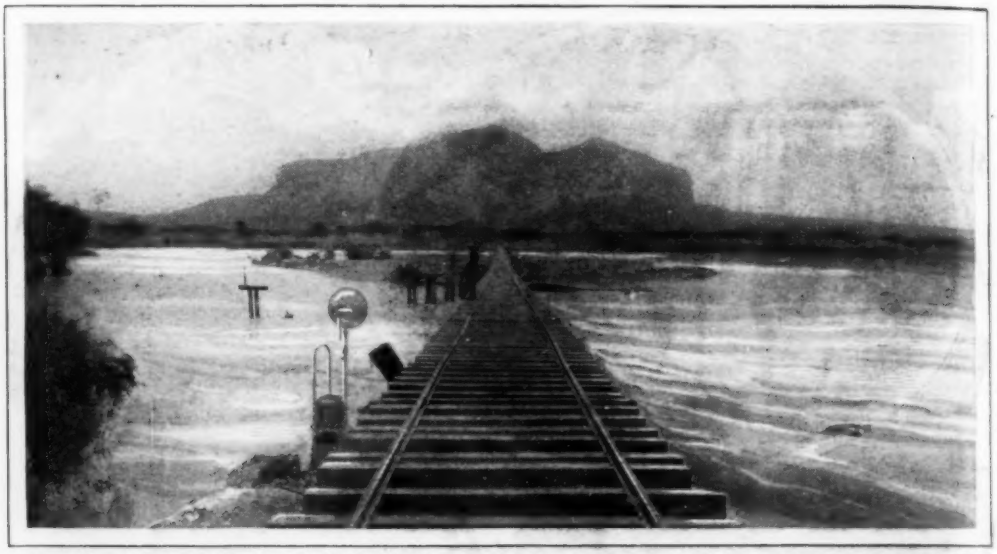


Donkey Trains Long Have Carried Freight between Central Plateau of Mexico and West Coast; Where the Railroad Crosses the Tropic of Cancer and Map of Territory Served by the Railroad; Link Complete but for Short Distance near Bottom

grade had to be run are so hard and flint-like that dynamite by the hundreds of tons was blasted before any digging could be started. In other places the lava hills and floes are so decomposed that digging into them was like digging in an ash heap. When such lava was encountered in deep cuts, it caused endless trouble and expense because the wall slid in and filled the excavations.

The cost of building the 103-mile connecting link between Tepic and La Quemada has been terrific; about $120,000 a mile to be exact. More than $12,000,000 have gone into the work thus far, and more millions will be spent before the first Pullman car makes the trip down the west coast of the Mexican republic. By January, 1927, the dream of Harriman and Randolph will have been realized under the direction of the present president of the company, H. B. Titcomb.

The expense of building the road, while great, is as nothing compared with the wealth it will produce. The population of the three west coast states—about



Beginning of Dam on Yaqui River, Which Is Expected to Add 850,000 Acres of Land to the Section of 150,000 Acres Now under Cultivation in the Valley

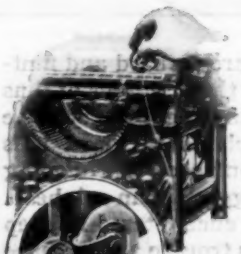
750,000—is only a fraction of those who will eventually find profitable investment or employment there. The agricultural growing season is twelve months of every year, and the soil yields abundantly of virtually every crop that can be produced in the temperate zones or the tropics.

In addition to its agricultural wealth, the west coast has mines of gold, silver and graphite, now in operation, and an almost unlimited area of mineralized country that has never been thoroughly prospected. The Gulf of California, and the coastal waters farther south, teem with more than 160 varieties of commercially marketable food fish. Oyster beds capable of supplying the demands of the entire western half of the United States also give rise to a pearl-fishing industry of importance. Forests of mahogany and tropical hardwoods require only the rail service to open them to world markets.

PLANTS POSSESS "SIXTH SENSE" SCIENTIST DECLARES

Certain species of plants have a mysterious sense that enables them to detect minute changes in the intensity of light unnoticed by the human eye, according to Sir Jagadis Bose, the well-known East India investigator. By means of delicate apparatus, he declares he has been able to determine plants' response to various shocks administered during experiments. Many react remarkably to certain light waves far above the scale to which the human retina is sensitive, he reports. Plants sleep much the same as living persons, the scientist asserts, but the familiar closing of leaflets does not always mean slumber or insensibility but may be a restful attitude assumed when the blossom has had sufficient sunshine and rain. The mimosa, for instance, awakens gradually between eight or nine o'clock and noon, remains alert until evening and does not fall fully asleep until toward the early hours of morning.

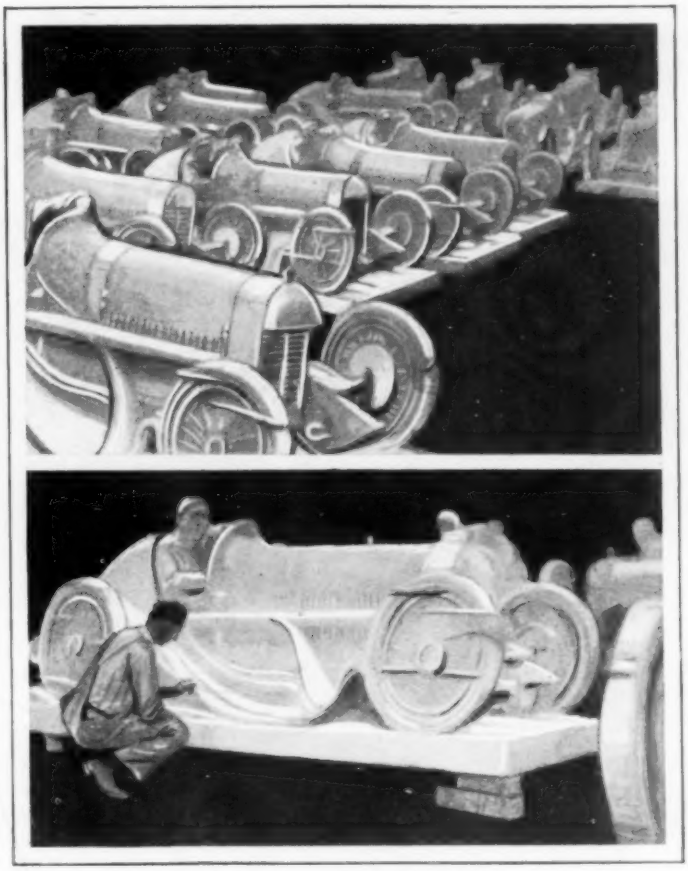
ERASER IN SPRING REEL SAVES TIME AND LOSS



Attached to a stout cord, sixteen inches long, which is wound on a spring reel, the typewriter eraser is kept readily accessible at all times and the stenographer is spared the time of putting it back into its place. The cord is automaticaly rewound in the reel when the eraser is released.

WAR GASES TESTED IN SOAP BUBBLES

Soap bubbles are blown for serious purposes at the bureau of standards where investigators are studying the action of various poison gases used in warfare. The bubble container has been found more satisfactory than steel jackets, for its transparency permits taking photographs which show how the flame spreads during explosions, pressure, and some of the reactions of the gas. In another department of the bureau, where fireproof tests are conducted, the interior of a one story building is destroyed almost daily in experiments with various protective materials. One of the articles examined recently was an asbestos theater curtain with an air space between two layers of the material. It was said to have shown no unusual degree of heat on the far side even after the other side had long been exposed to fire.



A Novelty in Outdoor Advertising; Plaster Models of Cars at Running Speed, to Suggest the Benefit of a Special Gasoline

JACK HELPS LAY WOOD FLOORS WITHOUT BRUISING BOARDS

While building a mountain cabin, a western woman encountered difficulty in laying the flooring without bruising the edges of the boards. She experimented with several methods and then adapted the principle of an old-style carpet stretcher to a jack to force the flooring together. It crowds the boards into place by the operation of a lever, and is easy to handle and set up. The device is now on the market.

PLASTER RACING-CAR MODELS HELP ADVERTISE GAS

Motorists in California are attracted by realistic models of a racing car set on pedestals at vantage points along the highways. The plaster replicas represent an auto in rapid passage down the track, the idea of speed suggested thereby being linked to the name of a special kind of automobile fuel.

JEWELRY MADE OF RUBBER

Jewelry of a rubber composition, designed especially for wear at the beaches, has become popular on the boulevards of Paris. Bracelets of many colors, imitation pearls and anklets as well as buttonhole bouquets of the material are in high favor. Large ear rings were also conspicuous features there last summer.

Striking Window Display Made by Attaching Front of Auto to Glass with Sealing Wax and Painting Streaks to Represent Cracks

CLEVER IMITATION AUTO CRASH PROVES EFFECTIVE DISPLAY

Paint, sealing wax and an automobile cut in two and fixed to the pane of a large show window, were skillfully used to advertise a new car model. The result gave the impression that the auto had plunged through the glass and stopped halfway, leaving the front exposed. Cracks in the pane were represented by paint, the wax sealed the bisected car to the window and the illusion was heightened by bits of glass and a barrier on the sidewalk.

FLOODLIGHT BANKS AND JAILS FOR BETTER PROTECTION

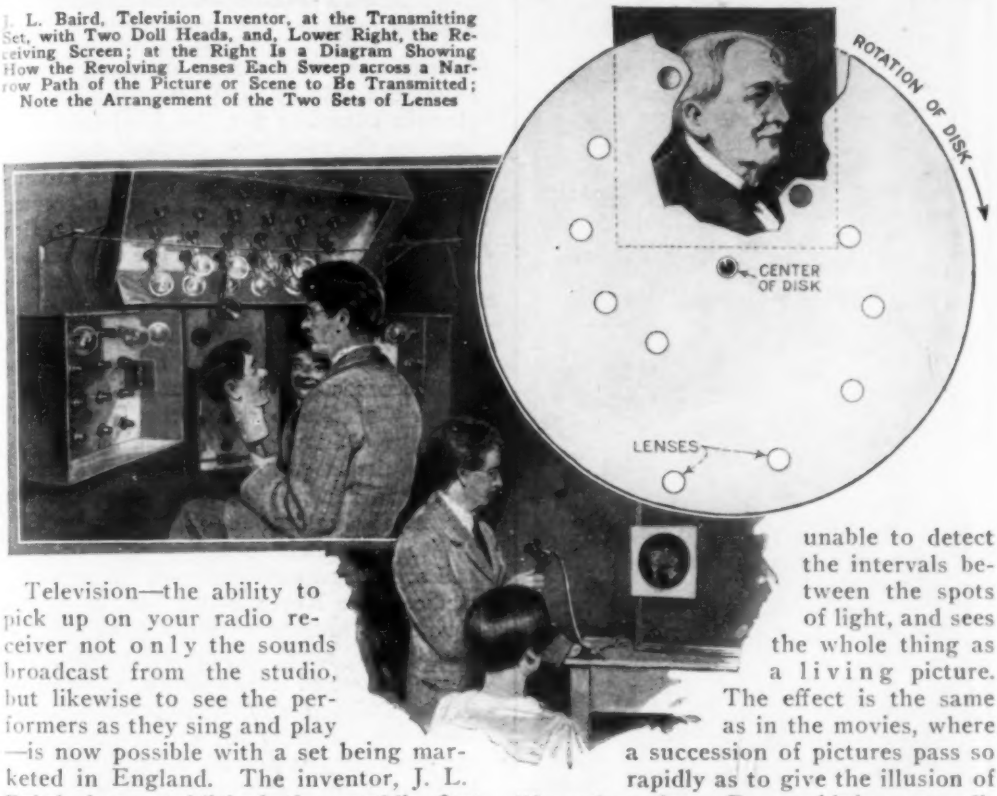
Electricity is being further adapted to the uses of man as a protector of valuables and as a means of greater security from criminals. Floodlights on jails and banks are affording this aid, according to reports from the Pennsylvania public-service information committee. Following the escape of a prisoner from a county jail in New Jersey, local officials authorized the installation of twelve 500-watt floodlighting projectors about the building. They were so brilliant and the illumination so well distributed that a spool of thread could be seen at a considerable distance if dropped from any part of the building. The sheriff considered the lights equivalent to an efficient increase in the ranks of the watchmen, as the glow made it almost impossible for anyone to escape from the jail without immediate detection. Floodlights on banks have been used for some time with equally good results, it is reported. One advantage is that the lamps are usually isolated from the bank so that persons intent on robbing have difficulty in cutting them off. Furthermore, the radiance shining in from the outside lights up the interior so that it is clearly visible to watchmen or the police outside.

CAPPER FOR GLASS BOTTLES PROTECTS THE HAND

Caps are quickly and firmly placed on bottles by hand with the aid of hammer and special stamp, shaped to fit the top of the container and press the cap in place. Should the glass break during the operation, the hand is protected by a shield of metal at the bottom on the capper.

RADIO EYE ENABLES YOU TO SEE STARS IN STUDIO

J. L. Baird, Television Inventor, at the Transmitting Set, with Two Doll Heads, and, Lower Right, the Receiving Screen; at the Right Is a Diagram Showing How the Revolving Lenses Each Sweep across a Narrow Path of the Picture or Scene to Be Transmitted; Note the Arrangement of the Two Sets of Lenses



Television—the ability to pick up on your radio receiver not only the sounds broadcast from the studio, but likewise to see the performers as they sing and play—is now possible with a set being marketed in England. The inventor, J. L. Baird, has established the world's first television studio in London, with a range of fifty miles, and within that area is selling radio sets that both see and hear. His system is very much like that employed in this country by C. Francis Jenkins, Washington, D. C., inventor who demonstrated radio movies and television in his laboratory eighteen months ago. Baird, who was experimenting with telephoned vision before radio broadcasting was thought of, reached his goal at about the same time Jenkins was producing similar results in this country. He uses a revolving disk containing sixteen lenses, staggered in groups of eight. At the transmitting station, the subject takes his place before the disk and, as it revolves, each successive lens transmits an image of a small portion of his person to a photo-electric cell. Because of the staggered arrangement of the lenses, each one takes a small sweep, but they revolve so fast that, at the receiving end, where a similar lens arrangement is employed, the eye is unable to detect the intervals between the spots of light, and sees the whole thing as a living picture. The effect is the same as in the movies, where a succession of pictures pass so rapidly as to give the illusion of life and motion. By combining an ordinary broadcasting outfit of microphone and transmitter, with the television apparatus, and employing the regular radio receiver in the home, along with the televisor, which has a small screen on which the pictures are seen, Baird furnishes both music or speech and actual sight of the performers. For the present, the pictures appear in black and white, like ordinary movies, but as soon as funds are available for further experiments, the inventor hopes to solve the problem of colors.

While Baird was installing his first receiving sets in England Jenkins was carrying his work in this country a step forward by successfully broadcasting complete daily weather maps. He believes the time is near when ships at sea will be equipped to receive weather maps giving far more information than can be transmitted in the code messages. By the map method the ship officers could see the location of every storm area and follow its course day by day around the world.

Bringing Up a Load of Rats, and Expert Catching One with Bare Hands in Paris Sewer

CATCHING LIVE RATS BY HAND AIDS FIGHT ON DISEASE

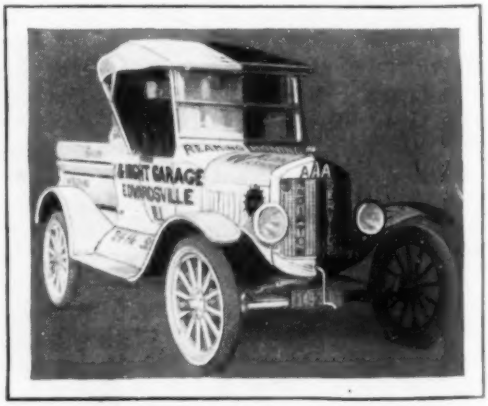
With a box over his shoulder and no aid save his bare hands, a rat catcher in Paris clambers into sewers and other unpleasant places in search of the rodents. He seizes the animals alive, pushes them through the funnel-shaped opening in his box, where they are held prisoners, and kills them later. Rigorous campaigns against rats are being prosecuted in nearly every large center in order to prevent the spread of contagious diseases and to reduce losses of food and other produce. In spite of all attempts to exterminate them, their numbers do not seem to decrease greatly, and some estimators declare that, in most localities, there are more rats than human beings.

FAST INTERURBAN LINE TOPS FIFTY-MILE SCHEDULE

The honors for the fastest regular electric-railway schedule in America, which have been held by the Galveston-Houston electric company for the 50.41-mile trip between the two cities, changed hands recently when the North Shore line at Chicago established a new high-speed service to Milwaukee. Traveling the 88.24 miles in two hours flat, trains on the new schedule maintain an average speed, including time lost in nine stops, of 44.12 miles an hour, while their actual running speed, exclusive of stops, is 51.9 miles an hour. Both records are about four miles an hour better than the marks of the Texas company. No allowance is made by the donors of the speed trophy for cars which are forced to run part of their route on city streets, through traffic. Few electric companies have their own city right of way, and are consequently slowed up by other traffic. The North Shore line, using the elevated structure within Chicago and a new cut-off north of the city to miss the densely settled north-shore towns between Chicago and Waukegan, has unusual opportunities for great speed. One car line runs at a rate of 38.5 miles an hour between Kansas City and St. Joseph, Mo., but the city tracks bring the average down to 31 miles.

BLACK-AND-WHITE TOWING CAR FOR DAY-NIGHT SERVICE

To emphasize the fact that twenty-four-hour service is available, the towing and



"Clown" Auto Advertising Day-and-Night Service

trouble cars of an Illinois garage are painted black on one side and white on the other. The idea is further developed by sun, moon and star decorations and a number of signs, stating what tasks the shop performs and what articles may be purchased.

CAR WHEELS OF PAPER

Paper used in the manufacture of railway-car wheels is known as calendered rye-straw board. It is sent to the shops in circular sheets and over each of these sheets is spread a coating of flour paste. A dozen sheets are placed one on the other and the lot subjected to pressure of 500 tons or more. After two hours' pressure these sheets, which have now become a solid block, are kept for a week in a drying room after which a number of blocks are pasted together, pressed, and dried for a second week. A third combination of layers is then made, after which there is an entire month of drying. To complete the wheel, there are required a steel tire, a cast-iron hub and a wrought-iron plate. Paper which has received the treatment described may be used for almost any purpose for which metal or wood is used if not too much exposed to dampness.

YOUNG SEALS GIVEN HAIRCUTS TO KEEP COUNT OF HERDS

Haircuts for seals is the latest fashion note from the Pribilof islands. According to Capt. A. A. Anderson, of the bureau of fisheries, 10,000 one-year-old male seals are to be sheared this year so that the census takers can more readily estimate the increase next year. The plan is adopted because only a certain percentage may be killed each season.

When Fireworks in Airplane Exploded Prematurely; Long White Streak Made by Falling Star Shell; Parachute Seen at Right

AIRPLANE FALLING IN FLAMES REGISTERS WEIRD PICTURE

An airplane set ablaze by a premature explosion of fireworks, its fall from a height of 5,000 feet and the parachute leap of one of the two occupants, were registered by camera film during a lucky time exposure. The photographer had planned to "shoot" the display and had just opened the shutter when the accident occurred. The burning plane made a streak of light, punctuated by successive bursts of fireworks. A brilliant blue-white star shell was recorded as a long white trail and one of the aviators was seen as a small speck just below the flaming machine. He appeared again lower down on the picture after his parachute had opened. Although both flyers landed safely, one died two days later from burns.

¶Whales have been known to fight for two days after being harpooned.

Symbol Adopted by Los Angeles Rotary Club in Campaign for International Friendliness

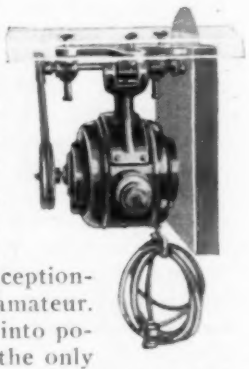
FLAGS OF THIRTY-FIVE NATIONS IN WORLD-PEACE SYMBOL

Emblematic of the world-wide spread of Rotary clubs, a symbol adopted by the Los Angeles organization in its campaign for international good will, bears thirty-five flags. There is a banner for each of the lands to which the club's movement has been carried.

DANGER IN STINGS OF INSECTS AND HOW TO TREAT BITES

Noxious insects indirectly take their toll of human life every year, and while those that sting may inflict more pain, those that bite may be a greater menace, since they are likely to carry harmful bacteria. The sting is a weapon and although its poison may be "clean," that is, free from germs, in certain species of wasps and bees there are two distinct poison sacs, containing entirely different substances which mix only as they are injected and react to produce an effect closely akin to that of the toxins of bacteria. Changes in the blood and disturbance of surrounding tissues result, temporarily throwing out of action the defensive mechanism of the injured part and leaving it at the mercy of a germ invasion. Scratching is a common source of infection. The temptation to do so may be lessened by applying ammonia or bicarbonate of soda. The biting equipment of various insects is often covered with germs from stagnant pools, garbage and filth. Because mosquito bites are more common than wasp stings, the danger of infection is proportionately increased. Common toilet soap, moistened and smeared on the bite will usually relieve the itching. Glycerin is even more effective. The house fly does not sting or bite, but carries germs that may lodge in scratches.

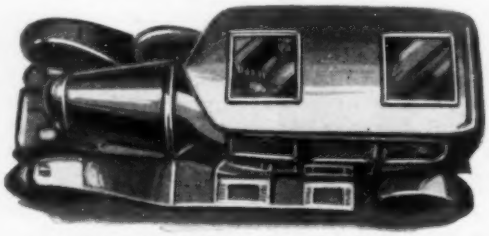
MOTOR SAW FITS ANY BENCH AND TAKES SMALL SPACE



Weighing but fifty pounds and occupying less than one and one-half cubic feet of space below the workbench or table, a motor-driven circular saw, operated from a lighting socket, saves time and is exceptionally useful to the amateur. It is quickly bolted into position for running, the only steps necessary being to bore three holes and cut a narrow slot for the saw.

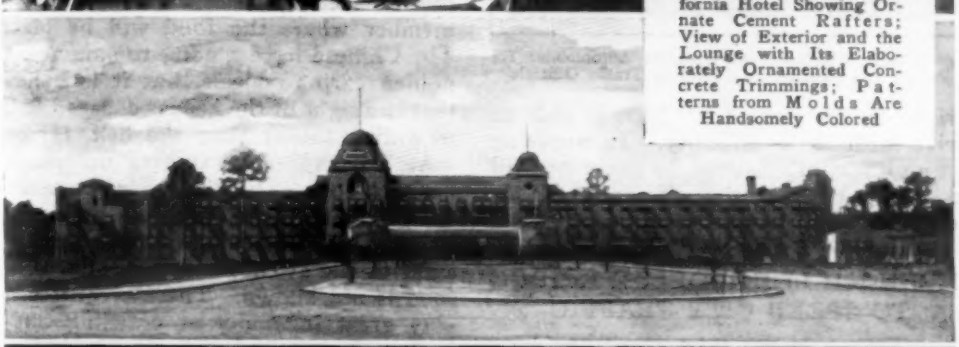
SKYLIGHTS IN AUTOMOBILE TOP PERMIT BETTER VIEW

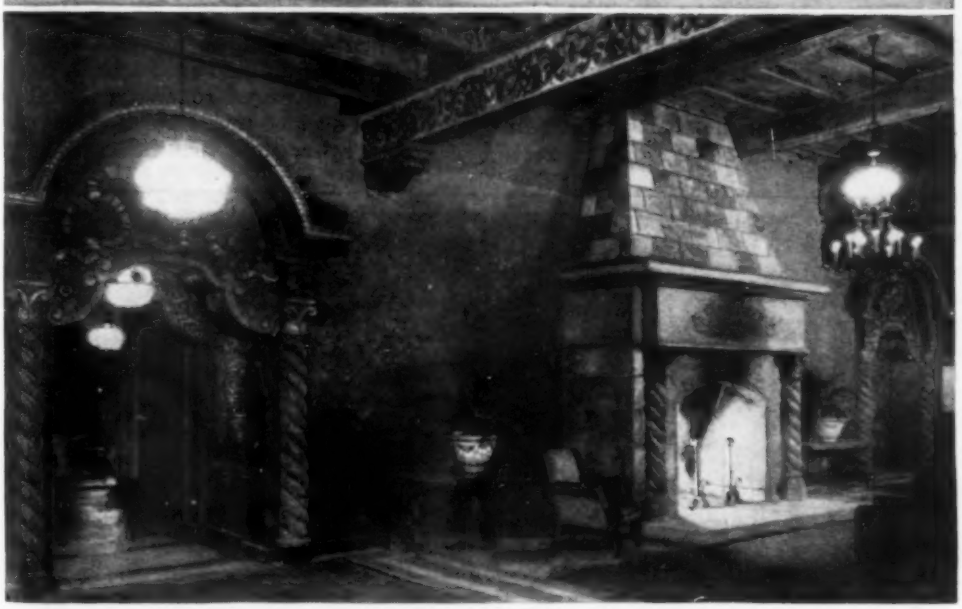
Windows of unbreakable glass have been installed in the top of a closed car of English manufacture, to give tourists a less obstructed view of the scenery. Shades are provided on the inside so that light and heat from the sun may be excluded if desired.



Auto Top with Skylights for Upward View

PAINTS AND STAINS BEAUTIFY ROUGH CONCRETE





Notable Example of the Decorative and Structural Possibilities of Concrete; Big Dining Room of California Hotel Showing Ornate Cement Rafters; View of Exterior and the Lounge with Its Elaborately Ornamented Concrete Trimmings; Patterns from Molds Are Handsomely Colored

LEVERS ON AUTO PEDALS HELP CRIPPLE DRIVE CAR

By means of hand levers attached to the pedals of his automobile, a cripple deprived of the use of his legs, is able to drive with little difficulty. In applying for an operator's license, he demonstrated to traffic officials the efficiency of his equipment.

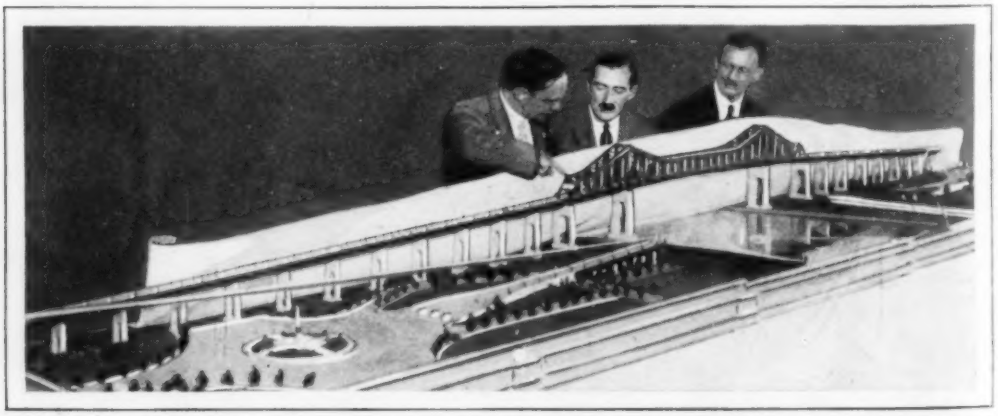
Levers with Which Cripple Operates Automobile; He Proved His Skill before a Jury of Traffic Officials

SEVEN-MILLION-DOLLAR BRIDGE TO SPEED CITY TRAFFIC

Guests at a Rotary club dinner in New York recently caught a vision of the huge bridge that is to be erected between Howlandhook, Staten island, and Elizabeth, N. J., when a model of the structure was unveiled. The gigantic link, it is expected, will be finished during 1928. It is to cost approximately $7,000,000, will be 8,500 feet long, sixty feet wide and will carry six lanes of traffic, two for pedestrians and four for vehicles. Some 35,000 autos and other vehicles can be handled hourly, it is estimated. Another large bridge is under way from Tottenville, Staten island, to Perth Amboy, New Jersey.

EELS ANSWER DINNER BELL

While fish generally are regarded as among the least intelligent of living things, studies conducted by Prof. H. M. Kyle, an English naturalist, show that they display evidences of emotion and mentality usually associated with higher forms of life. Many species in captivity are punctual at feeding times and appear to remember where the food will be placed. The Chinese have a gong to summon the golden carp to meals, but it is believed that the sight of the keeper causes the fish to gather rather than the bell, for they have no aural apparatus to differentiate between tones. Eels likewise assemble at the proper feeding time, but whether they respond to the sound of the signal, the sight of the attendant or the odor of the food is not known. These creatures display great ingenuity at crawling out of tanks. One in the London zoological gardens, unable to climb up head first, had turned around, thrown its tail over a ledge and managed to escape. Another showed a decided preference for a particular tank other than that in which it had



Model of the Bridge to Be Built between Staten Island and Elizabeth, N. J.; Four Traffic Lanes Will Be Devoted to Vehicles and Two to Pedestrians; Over All, the Bridge Will Be 8,500 Feet Long

been first placed and on two occasions traveled to that particular place, ignoring another tank on the way. Fishes often exhibit envy especially over choice morsels of food, Prof. Kyle declares.

COLOR OF DIAMONDS ALTERED BY EXPOSURE TO RADIUM

Yellow diamonds, comparatively cheap and plentiful, can be changed into valuable blue-white stones through exposure to radium, a New York investigator has discovered, according to reports. His tests have been conducted for four years and in that time, none of the altered gems has reverted to its original hue, but there is no way of telling definitely whether the change will be permanent. About $8,000 worth of the substance was required to change one diamond in four days. The scientist admits that the process is yet too costly to be commercially practical and is somewhat dangerous to the workers.

GUNS AND RADIO IN PEACE TIME PROTECT SHIPS IN FOGS

Wireless and artillery, the "war twins," have been adapted to a useful peace-time duty for the protection of those who go down to the sea in ships. A steady bombardment off the coast of Scotland, tells how successfully this has been brought about by remote radio control and ignition of an explosive mixture of acetylene and air. The firing is part of a fog-warning system installed on a sand bank at the entrance of the river Clyde. When the mists roll in, menacing shipping, impulses are sent from a radio transmitting station, a mile and a quarter from the guns. The sending set is synchronized with the receivers to prevent interference. The radio waves strike a valve on the receiver, open it and release and explode a mixture of gas and air.

Window-Sill Platform for Safe and Easy Washing Outside of Panes; Can Be Used with a Belt

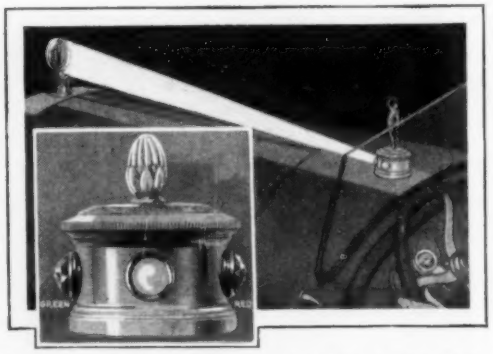
SCAFFOLD FOR WINDOW SILLS PREVENTS ACCIDENTS

Washing the outside of windows is simplified and made safer with an adjustable scaffold that rests on the sill. It may be adapted to various thicknesses and constructions of walls, is strong and rigid, and is said to be capable of carrying 1,000 pounds with safety.

Calculator Propped Up on Vacuum-Tipped Legs

VACUUM FEET FOR CALCULATOR

Adjustable to different heights, a two-legged stand slipped under the adding machine raises it to an angle where the operator may more easily strike the keys. There are vacuum cups on the ends of the supports so that they will not be likely to slip and scratch polished surfaces.



Ornament Holder in Place on Auto Cowl with Light Illuminating the Motor Meter

LIGHT FOR AUTO MOTOR METER ALSO HOLDS ORNAMENT

Mounted on the cowl of the car immediately in front of the windshield, a lighting attachment projects a brilliant beam upon the motor meter so that it can be clearly read at night, and also supports an ornament if desired. Besides the bright front glow, there are red and green jewels at the side which will provide the usual courtesy lights.

STRAP CLASP ON WRIST WATCH PREVENTS DROPPING

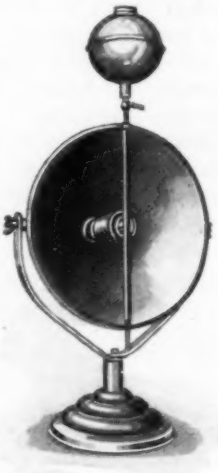
Loose strap ends are eliminated and the danger of dropping the watch reduced in a wrist clasp which is easily adjusted by means of a spring pin bar fitting in holes at the side of a metal hinge. This is curved so that it lies flat on the wrist and is practically concealed when the strap is in place.

POCKET-SIZE BALLOON WEIGHS NINETY-NINE POUNDS

So compact that it can be fitted into a soldier's haversack when folded up, a small balloon weighing but ninety-nine pounds fully equipped, has been introduced for short, thrilling rides and jumps. A horizontal propeller is mounted above the carrier for the pilot and may be turned and maneuvered by pulling on ropes. Inflated with gas, the bag is twenty-one feet in diameter and can be sent over trees and buildings while making a landing. A height of 840 feet has been attained, and the balloon has remained in the air two and one-half hours, according to reports of tests made by the inventor.

ELECTRIC HEATER FOR ROOMS ALSO WARMS WATER

Added to the familiar type of reflecting electric heater, an attachment has been devised by a German inventor for warming water. It is provided with connections that may be joined to the house mains if desired, or the water heater may quickly be removed and the reflector used alone. The arrangement is said to be especially suitable to heating small quantities of water for shaving and other uses.



MINES SUNK FOR OIL TO SERVE AS STORAGE TANKS

Digging mines into oil-bearing rocks instead of drilling holes has been proposed as a more efficient method for recovering the liquid mineral. The plan, as described by an eastern engineer, is to cut tunnels, not into the oil rock itself, but into the strata above or below it, the latter if possible. From these shafts, small holes would be bored into the layers containing the oil, pipes inserted in them and the product pumped to the surface. It has been suggested that these underground shafts would serve as storage basins for the oil, from which it could be collected at any time desired. Under the present boring system, it is said that only about one-fifth of the oil flows or is pumped to the surface, the rest being trapped in cavities of the porous rock.

ELECTRICITY KILLS GERMS IN WATER

Purification of water by electrocuting the injurious bacteria, instead of killing them with chemicals that leave an unpleasant taste, has been recommended by attaches of the water bureau of an eastern city. Their method consists in sending a direct current and high-frequency alternating charges through the settling basins by means of special electrodes. Tests have shown that water from Lake Erie, after being treated in this way, was free from bacteria and sterilized. The common way of purifying drinking water for towns and cities is to treat it with chlorine or other chemicals to kill harmful bacteria. The substances are supplied in amounts proportioned to the consumption of water, but where contamination is likely from heavy rains or backing up of sewage, extra-large quantities are often put into the water as a precaution. An unpleasant taste is usually the result. This would be avoided with the electrical treatment, it is said.

Packing the Folding Boat and Demonstrating Its Light Weight; a Canvas Covering Is Stretched over the Ribs

COLLAPSIBLE CANVAS BOAT FITS IN TRUNK

The framework of a patented German boat is dismantled into short lengths, which, with the canvas covering, can be stowed away in a trunk for easy carrying. Strength and light weight are also features of the craft. It seats two persons and is made of duralumin, weighing only twenty-two pounds.

FOLDING COAT HANGER SERVES AS CLOTHES BRUSH

Bristles on a collapsible coat hanger convert the article into a serviceable brush and, since the accessory folds up flat, it is especially convenient for travelers. Part of the hanger affords a comfortable grip.

RED LIGHTS IN WINTER GIVE EFFECT OF WARMTH

Colored lights help keep theater patrons warm in winter and cool in summer, according to reports from managers. It has been found that the use of reds and yellows in cold weather produces a feeling of warmth, while greens and blues suggest the outdoors and other cooling ideas.

"HEAT CABINETS" BEAUTIFY HOME AND SAVE FUEL

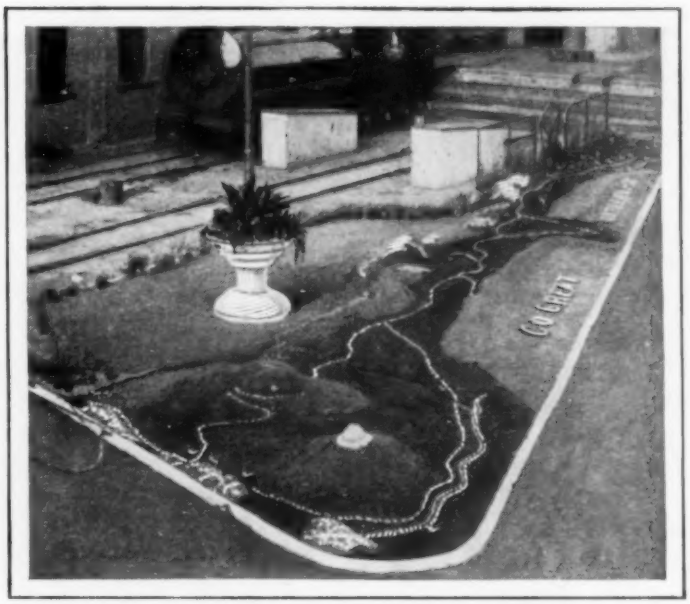
Introducing a Variation of the Usual Type of Radiator; Heating Pipes Pass through Series of Copper Fins Which Give Off Warmth; Cut-Out View of Cabinet and Typical Installations

Claimed to be more efficient than cast-iron radiators, a "heat cabinet," recently invented, occupies virtually the same space as the familiar radiator, but can, if desired, be built into the wall to save floor space. It introduces a radically new idea in heating. In the base a comparatively small amount of pipe passes through a series of closely spaced copper radiating fins, which draw the heat from the pipe rapidly and give it up to the air. The air current enters at the bottom and passes up between the fins. Above them, in the space which would be filled up with the pipes of the usual radiator, there is a chimneylike air chamber, through which the heated air passes, escaping into the room through a grill at the top. A damper is provided to shut off the air current, and when that is done it is claimed that the device immediately ceases to radiate heat, since the copper unit remains at a constant temperature without giving off heat, except in an air current. The device is being marketed for use with hot water, steam, vapor or vacuum-heating systems, and comes in various sizes, based on the equivalent heating values of cast-iron radiators. The

cabinets of the room-type heaters come unpainted, in order that they may be decorated to match the room. The prices, according to the makers, are less than for an iron radiator with shield. Because of the arrangement of the grill at the front, it is claimed that all the heated air is thrown out into the room, preventing soiling of the walls.

TREE ROOTS THAT POISON PLANTS

Walnut and butternut-tree roots are poisonous to plants, and even weeds whose roots come in contact with them, according to Prof. A. B. Massey of the Virginia experiment station. He declares that there is a substance in the bark of the tree roots which injures others that touch it. This material is not distributed widely through the soil, he declares, but old settlers in various parts of the country have reported that good crops will not grow for several seasons in a newly cleared walnut or butternut area. Gardeners have observed that tomatoes and potatoes will not thrive under the trees and, in Vermont, the failure of a virile weed to grow near butternut trees is noticeable. In Indiana, the leading tomato state of the Union, the harmful effects of the two trees growing in fence rows or in the fields are frequently of economic importance to growers of this vegetable, and in various parts of the country the death of certain weeds and even young apple trees in the vicinity of walnut and butternut trees has often been observed.



Map of Railroad Traced in Flowers for Garden Ornament; the Design Required Nearly 40,000 Plants

REPLICA OF RAILWAY SYSTEM DESIGNED IN FLOWERS

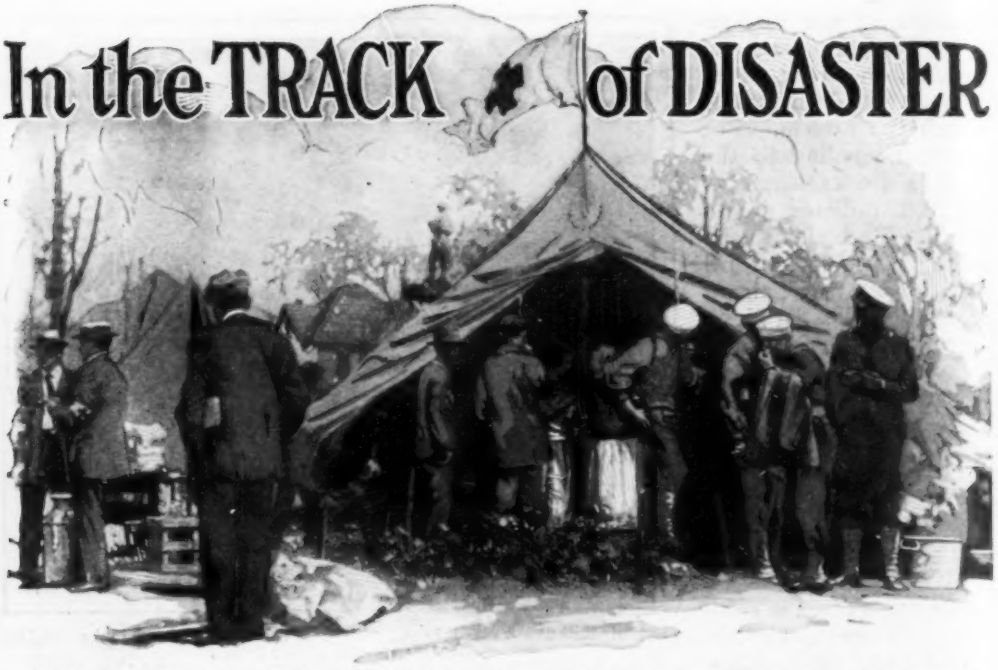
Shopmen employed by a western railroad devote part of their noon hour to care for a flower garden they have set out in unique fashion. It represents the entire route of the system, nearly 40,000 plants being used to trace the design. Tunnels, mountains and other features are depicted in the 118-foot plot.

HOBBYHORSE RUN BY ROCKING GIVES CHILDREN EXERCISE

Riding the Hobbyhorses That Move on Wheels as Child Shifts His Weight

Rocking backward and forward on a hobbyhorse a western inventor has devised for outdoor or indoor play, propels it at a moderate rate of speed. The rider is seated over a main bearing at the center, and as the weight is shifted, cranks actuate the front and rear wheels. The motion gives children an added thrill.

In the TRACK of DISASTER



A Red Cross Tent Springs Up in the Midst of Tornado Ruins, Ready to Serve Emergency Rations to Relief Workers and Victims of the Disaster Who Are Drawn to Its Flag

THE first mighty concussion that ripped open the great naval munitions depot at Lake Denmark a few weeks ago was heard for fifty miles or more around, and left a trail of shattered windows and tipsy houses more than a score of miles across.

The column of smoke and dust that was flung a thousand feet in the air above the bursting shell stores had hardly reached its height before Red Cross flags were flapping in the breeze of a score of towns and villages, doctors had established emergency dressing stations, victims were being treated, field kitchens were being stoked in preparation for dinner and relief work was under way.

All that was done without any one ordering it, in fact, before the National Red Cross headquarters, hundreds of miles away in Washington, knew that there had been an explosion. For that is the way the disaster relief of the Red Cross works. Like the marines that "landed and have the situation well in hand," the local Red Cross units frequently have the emergency in hand before the telegraph can get word to the capital that help is needed.

Some 3,600 local chapters, each one, as a rule, embracing a county; something more than 40,000 trained nurses enlisted for special duty, and a mobile force of practically all the doctors and surgeons in the land explain the Red Cross' ability to cope with flood, fire, tornado, explosion, earthquake or other disaster, greater or lesser, while it is still taking place.

There may be a peaceful, well-behaved little river flowing through your town, that never has gone on a rampage, but the chances are that the local Red Cross chapter has considered the possibility of a flood some day, decided just whose homes and stores are likely to be affected, who will have to be fed and lodged and clothed, how many will need medical treatment, and, more important still, whose house will have to be rebuilt so that the owner can get back on his feet again.

For the Red Cross' interpretation of disaster relief does not end with tying up the physical wounds, feeding the victims for a few days in an open-air kitchen and then going home about the time the story is moving off the front page, to go back next to advertising on some inside sheet of the daily paper. About that time, when the photographers and reporters have all left, the Red Cross is just settling down to

Rolling Kitchens, Manned by Army Cooks, Helping the Red Cross in a Texas Flood, and a Trained Nurse

work, and when the last unit leaves, conditions will be restored, insofar as possible, to just what they were before the disaster.

Take the case of the hundreds of farmers who were left in ruins when a tornado swept across southern Illinois some eighteen months ago, leveling several towns and a broad swath of prosperous farm land. The Red Cross was on the scene, by train, automobile and airplane, within a few hours. From near-by warehouses, tents, cots, bedding, medical supplies and food poured into the zone. Within a few hours the homeless were under cover and fed, the injured were being treated in emergency hospitals by scores of volunteer Red Cross doctors and nurses, and the dead were being cared for, too.

But days later, when the last emergency-relief measure was over, when the towns had begun to rebuild, the real Red Cross job started. Out into the country swept motor caravans, each with from fifty to 100 men, carrying tools, supplies, and their own tents and traveling kitchen. They swept the devastated territory from one side to the other, and at each farm they stopped, cleared the fields of debris, made temporary repairs to wrecked barns and houses, and, in some cases, even helped with the plowing and furnished the seeds, in order that the farmer might be sure of

Above Is the Red Cross Disaster Map, Whose Colored Dots Show the Distribution of Storms, Fires, Tornadoes, Earthquakes and Other Emergencies in Which the National Organization Has Rendered Relief; at the Left Is a Truckload of Blankets and Mattresses Being Rushed from the Red Cross Warehouse to the Relief of Sufferers from a Devastating Tornado; Enormous Supplies of Tents, Bedding and Medical Stores Are Maintained at Many Strategic Points

Red Cross Workers Were Among the First to Reach the Airship "Shenandoah"

making a crop. In one day, one of the caravans could do as much work as the farmer alone could accomplish in a season.

The work of the emergency-repair caravan is followed closely by other assistance, looking toward permanent rehabilitation. While the emergency workers are still in the field, a careful survey is being made to determine what will be needed to get everyone back on his feet. The farmer who is in difficulty is given financial awards from the relief fund to buy live stock, farm implements, feed and seed, as well as furniture, clothing and material and labor for the rebuilding of his house, barns and fences.

In towns and villages the same effort is made. Instead of the farmer's live stock, seed and implements, the sufferer may even have a store or other business replaced, if that is necessary to restore him to the self-supporting position he formerly occupied.

Widows and orphans of the disaster get special attention, the first receiving support and vocational education, and the children getting trust funds to maintain and educate them until they

An Emergency Field Kitchen, Top; the Poster to Be Used in This Year's Roll Call, and a First-Aid Station

are old enough to earn their own living. Many of these trust funds cover a period of several years.

It is by its first emergency work, however, that the Red Cross is best known. The speed with which its supplies and workers get into action is often amazing. Frequently the disaster itself has been anticipated by days through constant watch of weather reports. It is seldom that a flood, unless due to a bursting dam, can catch the Red Cross unprepared, and even then it is only a question of a few hours until relief is on the ground. Earthquake zones are well known, and relief plans for all of them are prepared against emergency. The same is true with the tornado and cyclone belts, which can be plotted and studied. The particular requirements of each type of emergency—based on the study of some 850 disasters coped with since the organization was formed in 1905—are known. For example, medical aid is the predominant need after a tornado, whereas food, tents and clothing are most needed by flood and fire victims.

With the country divided into three districts, each under an assistant national director, and with more than 300 trained volunteer disaster workers who can be mobilized anywhere on short notice, the problem of organizing relief is simplified. The local chapter is first on the job, quickly followed by newcomers with first-aid stations, canteens, food depots, tent cities and anything else needed.

Less than an hour after the first quake shock in Santa Barbara, a tent flying the Red Cross flag was in action. The injured naturally gravitated to this refuge, and a doctor who happened to be in town on a holiday was hard at work.

Not far away women and girls are preparing emergency rations, ranging from canned beans to cocoa, for the army of volunteer workers, hastily organized by a reserve officer, and who are now tearing at the debris to rescue the injured and remove the dead. A bricklayer, arriving from nowhere, has already constructed a field oven, and stoked it with parts salvaged from the ruined front of a near-by store. On the oven, coffee is cooking in tub lots, side by side with a tub of hot dogs. The cooks are a boy who belongs

Murphysboro, Illinois, as It Looked after the Tornado Last Year, When a Large Part of the Town Was Wiped Out, and, at Top of Page, as It Was Rebuilt with Red Cross Aid

to the naval reserve and another boy whose worldly goods are safely buried under the ruins of a wrecked house. A flivver covered with collegiate mottoes is busy delivering the food to the relief workers throughout the town.

All of that happened in the first hour. Apparently it is a haphazard growth, but close inspection shows that someone is directing things. The food supplies, for example, increase faster than consumption. Telegrams are being sent and received, covering every phase of the disaster. A fully manned relief train rolls in from Los Angeles, with a hospital unit equipped to care for more sufferers than have yet been discovered. Tent streets begin to appear, and no matter what emergency arises, it is being met.

That is just one disaster, and there are approximately 100 a year, of one kind or another, which require Red Cross aid. That figures out a disaster for every three and a fraction days, or about two disasters a week, in round numbers. Some of them are small, affecting only a few people, and others involve thousands and cost millions to meet. The cost, regardless of its size, comes out of the fund provided each year in the annual membership roll call, extending from Armistice day, Nov. 11, to Thanksgiving.

Although its assistance has been given in more than 800 disasters since its incorporation in January, 1905, the work of the Red Cross did not really enlist nation-wide support until the war. A couple of million boys under arms learned first-hand what the Red Cross meant, and millions at home came into intimate contact with it.

Out of that wartime work grew the present vast organization of local chapters, some 3,600 in all, and the millions of volunteer workers who rolled bandages, prepared medical supplies, handled messages from the front and looked after the needs of the families of soldiers willingly continued their efforts when peace was restored.

There is no other institution quite like it—prepared to give emergency relief at a moment's notice at any point, in the United States as well as abroad. Great disasters overseas, such as the Japanese earthquake, have been met with Red Cross aid as readily as a similar tragedy at home.

The Rehabilitation of Murphysboro Is Typical of the Work Done by the Red Cross to Restore Each Disaster Survivor as Nearly as Possible to the Same State He Occupied before the Emergency

Stone Monument Erected on Site of Battle of Spokane Plains, One of the Last Big Fights between Indians and Whites

SCENE OF BIG INDIAN BATTLE MARKED BY MONUMENT

To commemorate the battle of Spokane plains, the last big fight between the Indians and the whites in the Pacific northwest, a stone monument was dedicated during the second national Indian congress. Some of the descendants of the warriors who participated in the battle attended the ceremonies. The monument was unveiled by Princess America I, great-great-granddaughter of an Indian chief.

TINY VERTICAL-ENGINE MODEL SHOWS INVENTOR'S SKILL

What is believed to be the smallest working model of a vertical engine has been constructed by a California inventor. Its size is apparent contrasted with the man's hand it stands on.

FLOWERS CUT IN EVENING LIVE LONGER

Flowers, cut the evening before they are to be used and kept overnight with their stems submerged in water, will last longer than those cut in the morning, according to James H. Burdett, director of the national garden bureau. Care should be taken that the blossoms themselves are not in the water. Cutting the flowers benefits most plants and improves the second crop of blossoms. Annuals, for instance, such as zinnias, cosmos, larkspur, snapdragons and marigolds, will produce a more bountiful crop of blossoms by cutting. If the flowers are not removed, they fade and form seeds, and this halts the blooming. The perennials will not stand such frequent cutting, as most produce only one or two crops, but if the first is cut back, the second is usually a better one.

LAMP THAT LIGHTS IF TILTED SAVES TURNING SWITCH

Inclosed in a ball-shaped shade, an electric lamp especially for the sick room, nursery or reading table, is lighted or extinguished simply by tilting it forward or backward. This movement actuates a small adjustable switch within the holder and saves the trouble of pressing a wall button. It is noiseless, directs the rays where they are most needed and protects the eyes from glare.

¶In their natural state, diamonds are usually of a dull-lead color.

Three Scenes from Railway History Emphasizing the Changes of Less Than Fifty Years; Pioneer Wood-Burning Locomotive at Left, Coal-Fired Unit in Center and, at Right, Electric Train

FROM CORDWOOD TO KILOWATT TALE OF RAILWAY PROGRESS

Transportation's rapid changes are illustrated on the suburban lines of the Illinois Central railroad at Chicago. Less than fifty years ago, the engines burned cordwood and a speed of twenty miles an hour was considered remarkable. Coal brought faster schedules, but steam is now largely supplanted by electricity in a trolley system with motor cars in place of locomotives. The three great "periods" in the railroad's history were represented in an exhibit showing a pioneer engine with a later coal burner and one of the electric trains lately put into service.

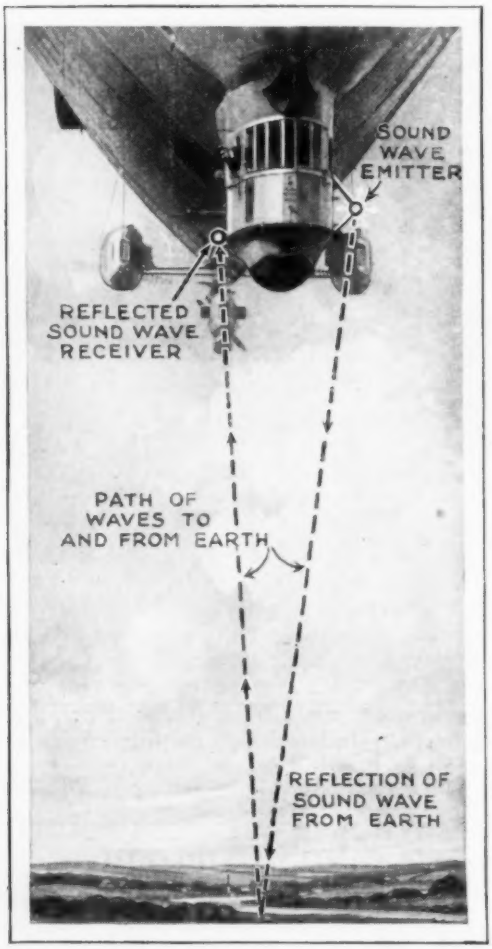
MUSIC-ROLL EDITING SAVES NATURAL EXPRESSION

One of the less familiar professions is that of editing music rolls for player pianos after the original has been prepared for duplication. The master roll is generally made directly by an electrical apparatus connected to the piano which the artist plays. The editor reads the perforations on the roll just as the musician reads the notes and from them decides where to put the expression lines, words and other printed matter that will appear on the duplicate rolls. These marks are glued to the master roll in raised rubber type and duplication made by a modified printing process. Under skilled editing, copies as good as the original will result.

PLAYHOUSE WITH TEN ROOMS IS FAMILY HEIRLOOM

Built along true architectural lines, a playhouse has served three generations of an eastern family. It contains ten rooms and an attic and still is in good condition.

Built like a Real House, This Plaything Is Still in Good Condition after Many Years of Use



Dirigible Equipped with Altitude "Sounding" Apparatus and Diagram of Action

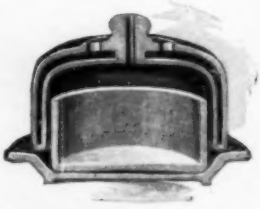
AIRSHIP'S ALTITUDE IN FOGS MEASURED BY ECHO

Almost every aircraft is provided with a barometer or similar instrument for determining height, but many of these have proved unreliable beyond a certain altitude and many accidents in fogs and in darkness have resulted. A German inventor has adapted the echo method of sounding on steamers to the airship and the airplane with good results, it is reported. The method is essentially the same as that used on water. Sound waves travel from an emitter on one side of the ship, strike the ground and are reflected back where they are registered on a receiver at the other side of the craft. From the time interval between emission and reception of the sound, the altitude of the ship is found by a simple calculation. Tests have proved the "echophone" reliable.

SOUND-SLEEP PERIOD LESS THAN FIVE MINUTES A NIGHT

From 14,448 measurements of the soundness of sleep of twelve young men subjects at the Mellon Institute for Industrial Research, it was found that they slept without stirring for an average of only a little more than eleven minutes at a time, and, in half of the observations, the average rest period was less than five minutes in length. These facts were determined by having the subjects sleep in special beds equipped with apparatus that recorded any movement such as a change in the position of the limbs or the head. The sleepers retired at eleven o'clock and arose at seven in the morning. Factors designed to produce sound sleep, such as quiet and good ventilation, were carefully watched. In only one of the observations was the period of quiet more than three hours long. The observers concluded that the average healthy person sleeps much less soundly, that is, with much shorter intervals without noticeable movement than is commonly supposed. Fatigue after a day of hard work interfered with sleep in at least one observation. Some subjects rested more during the first half of the night, while others enjoyed greater benefits from the last half and other periods. The tendency of the subjects was to exhibit less activity during the first hour of slumber after settling down to rest, but this steady rest began any time from ten minutes to two hours after retiring.

ICELESS REFRIGERATING DISH KEEPS BUTTER FRESH

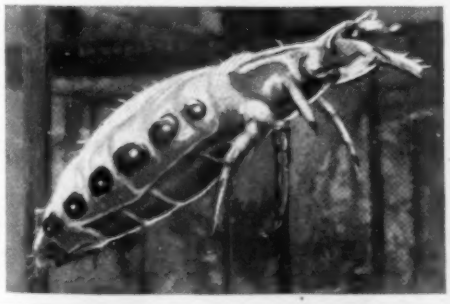


Butter and other foods are kept from spoiling in hot weather in a dish having a dome-shaped top containing a water chamber. The cover is of earthenware, sufficiently porous to produce evaporation, thus reducing the temperature inside the dish.

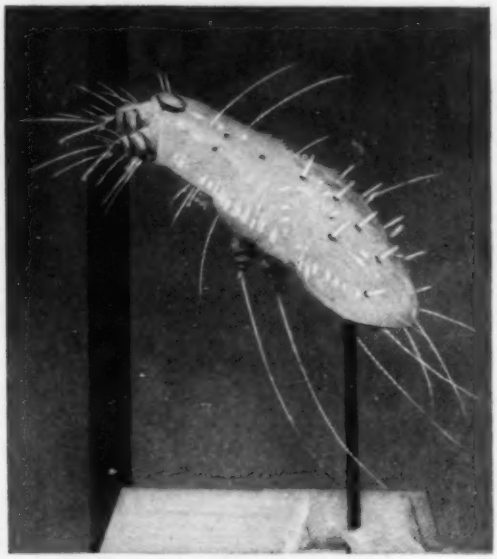
INSECT MODELS ARE AS BIG AS DOGS

How the Fierce West African Horse Fly Looks When Enlarged Twenty-Eight Times

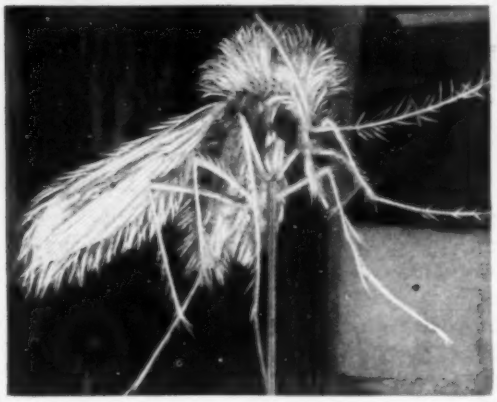
School Children Examining Models in Natural History Museum at South Kensington, England



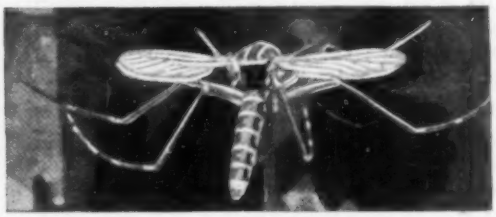
Replica of Louse, a Typhus Carrier, 1,000 Times Larger than the Original



Itch Mite, the Tiny Insect That Causes an Unpleasant Skin Affection on Persons



Two-Foot Model of Sand Fly Has Nearly 2,000 Hairs Set in Natural Fashion



Mosquito, the Yellow-Fever Germ Carrier, as It Looks Enlarged Twenty-Eight Times

Courtesy The Sphere

Cigarets on One Side, Matches on the Other in a Single Handy Package for Smokers

BOX OF CIGARETS AND MATCHES IN ONE PACKAGE

Cigarets and fourteen matches with an ignition surface are sold in one package under an arrangement devised by an English inventor. This saves pocket room and insures the smoker a light. The match compartment can be refilled in case the original supply gives out.

SIGNALS SENT BY WINDMILLS AS SUBSTITUTE FOR PHONE

Countryfolk in Holland still use their windmills for purposes of communication as they did during the times of William of Orange and the Spanish invasion. By moving the wheels slightly and turning them to different angles, a message is spelled out in code and relayed many miles, sometimes to another mill below the horizon. Private codes are used, but there are common signals for calling a doctor or policeman, for instance, or for the miller to signal that he is waiting for grist from the farmers.

GERMS TO AID PLANT GROWTH RAISED IN LABORATORY

Investigators at the university of Wisconsin have been making experiments to find the best strains of germs which will aid the development of peas, soybeans, alfalfa and other crops. For some time, it has been known that inoculation of the seeds of these plants cause little nodules to form on the roots and that these protuberances take nitrogen from the air, transforming it into growth-producing material. Some bacteria seem to be more effective than others in producing the nodules. The aim of the scientists is to isolate a strain that can be depended upon to achieve the desired effect in the most abundant manner.

HINGED GUARD FOR LIGHT BULB HAS HANDLE AND HOOK

Electric-lamp bulbs on extension cords are easily inserted and well protected against breakage in a safety unit that combines a handle and hook at the top for holding the light. One side of the guard is on hinges so that it may be opened quickly for the insertion or removal of a bulb without taking off the entire shield. The other side is shaded, if desired. The two lock securely together and cannot be disengaged accidentally.

Lamp Bracket Open and Closed, the Insulated Handle, and the Hook That Is Attached to Objects

Finished Picture Is at Upper Right; the Others Are Studio Poses of the Groups, to Express the Desired Action

TRICKS IN PHOTOGRAPHY SERVE ARTIST AND ILLUSTRATOR

Without leaving his studio except to obtain pictures of appropriate backgrounds, the camera artist is able to produce a wide variety of views by the use of composite photography. It is a form of trick work such as is employed in making the thriller scenes for the movies, but besides yielding realistic results, it saves time and cost and enables the photographer to turn out a high-grade picture, since he has the advantages of good lighting, accurate focusing and other favorable conditions. The process consists chiefly in photographing several pictures at once to obtain a single view. For instance, it is desired to produce a camping scene. Groups are posed under the lights of the studio to show a boat in the water, a cookstove in operation and other typical action views. These are then reduced to proper size to fit the background, pasted on and the whole photographed after retouching to conceal any marks or discrepancies. Some studios have large equipments of special settings and keep lists of men and women whom they may call upon to pose for various purposes.

¶The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession will be furnished promptly by addressing the bureau.

Crib Lowered for Use and Folded Up against Auto-Seat Back Where It Is Out of the Way

FOLDING AUTO CRIB FOR CHILD HAS POCKETS FOR TOYS

Folding flat against the rear of the front seat when not in use, a fabric crib affords a comfortable place for a child up to seven years old to ride in the automobile. The cover is detachable for laundering, and there are pockets for holding milk bottles, toys and other articles for the comfort and amusement of the youngster.

FOOD PRICES ON CAFE DISHES SIMPLIFY FIGURING BILL

Patrons of sidewalk cafes in Paris do not have to wait for checks and are protected from errors in charges, as the price of the foods is stamped on the dishes in which they are served. If, for instance, a second cup of chocolate is desired, the emptied container will be set to one side, and the new one is printed with the price of the two cups. When the customer is ready to pay, he need not depend on the memory of the waiter or scan a bill of fare, since he can determine the amount of his bill by simply adding up the figures on the dishes.

BUMP TESTS FOR MOTOR-CAR TIRES INSURE QUALITY

Auto tires for government use are given a severe test for endurance at the bureau of standards. They are mounted in stationary bearings with the tread against a revolving flat rim on which are three cleats arranged to give the tire 9,000 bumps for every mile the rim turns. Each tire is subjected to forty-eight continuous hours of this testing, receiving 27,000 bumps an hour or 1,296,000 in all. Pressure can be regulated, and some of the tires are said to have proved their ability to stand up satisfactorily under the equivalent of a load of one and one-half tons.

RAIL-DEFECT DETECTOR TELLS OF HIDDEN FLAWS

By means of an electric tester, devised by a Japanese inventor, defects in railroad rails are said to be quickly and accurately located and, at the same time, their presence recorded on a moving roll of paper. The apparatus is connected to an ordinary inspection car and is said to be simple to adjust and operate.

Rail Tester in Operation behind an Inspection Car on Japanese Line; Note Attachment to Rails

SHAFT RECORDS DEEDS OF WESTERN PIONEERS

Dedicated to the early explorers who helped win the northwest for the United States, a memorial shaft, 125 feet high, has been erected near Astoria, Oreg., one of the oldest white settlements on the Pacific. In a colorful frieze that winds from the top of the column to the bottom, sketches depicting scenes of pioneer days have been carved. The pictorial pattern is 525 feet long and was formed by placing a layer of white cement over a colored one, applied to the rough fluted surface of the shaft. The designs were cut through the outer layer, exposing the colored material below. The column was erected in memory of Capt. Robert Gray, the discoverer of the Columbia river, Lewis and Clark, the daring adventurers who crossed the Indian-infested plains, and John Jacob Astor, trader, who founded Astoria. A spiral stairway leads to an observation platform on top of the shaft. Astor established the settlement after a perilous trip across the country and intended that it should be a central depot between the Great Lakes and the Orient for his huge fur business. The post prospered for a time, but later was seized by the English. It was restored to U. S. in 1918.

Shaft Partly Finished, Showing Arrangement of Pictures, and, in Center, Dedication Ceremonies; Right, Another Monument Dedicated at Site of an Old Indian Village

SOFT MUSIC CALMS ANIMALS ZOO TESTS SHOW

Experiments with caged animals have indicated that lions are apparently fond of piano music when the upper and middle notes are struck, but they roar when the base keys are played loudly. Tigers exhibit a similar aversion to the shrill notes of the fife. This is believed to be due to the fact that the tiger's ears are extremely sensitive and certain vibrations cause the animal to suffer pain. These reactions substantiate reports of persons traveling in the jungles being saved from wild beasts by music. In some countries where oxen are still used for labor, the beasts seem to work better when the driver sings, and it is also customary for the Arabs to sing to their camels on long journeys.

RICHES IN RUBBISH

Waste from factories using wool was generally burned, but now much of it is sold for fertilizer. Worn-out sponges are carbonized and employed in the manufacture of iodine. Old bones are utilized as ivory substitute, sawdust is converted into fuel, and thousands of dollars are salvaged from the sweepings of dental and jewelry workshops. Even the chimneys and the clothing of the workers yield precious fragments of metal.

Copyright, Underwood & Underwood

Portion of Auditorium Interior, National Academy of Sciences; Walls Are of Acoustic Tile and Mural Paintings in Soft Colors Describe Man's Search for Truth through the Ages

© Henry Miller
Contrast in Electric Bulbs; the Large One Gives About 2,000 Times the Light of an Ordinary Forty-Watt Lamp; the Small One Is Used for Surgical Purposes

Where You Can See Your Voice and Bend a Six-Inch Bar of Iron

Science Building at Nation's Capital Is Equipped to Reveal the Hidden Wonders of the Universe

By OTTO WILSON

"IF I could only see it for myself!"

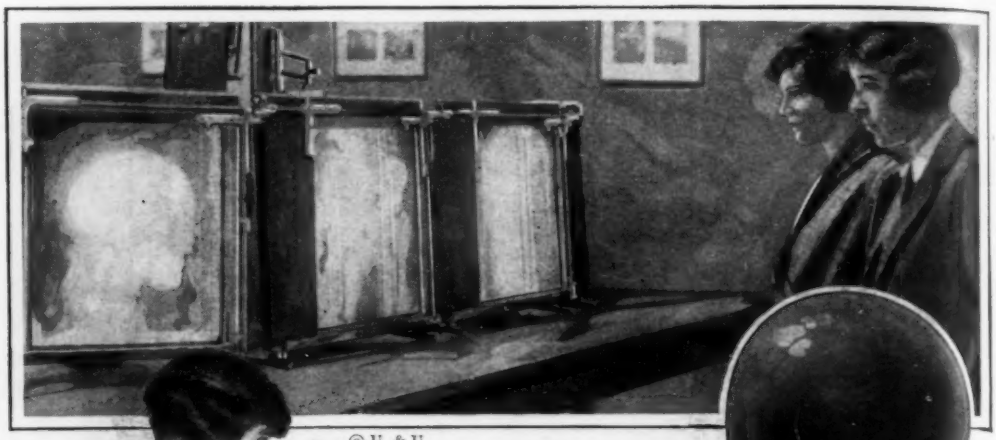
How often that exclamation has come to our lips when we have been reading of some new, startling, perhaps epoch-making discovery. Not until we can see the demonstration with our own eyes or handle it with our hands does it really come home to us.

But our desire is not half so keen as is that of the scientist himself to make us understand some of the strange truths he is revealing. He moves in a land of everlasting romance, watching the inner workings of the universe. It is one of his deepest regrets that he cannot make the passing world see and appreciate the wonders that strike his vision.

To throw one more frail bridge across the gap which separates the public from this modern wonder world, the National Academy of sciences has set aside practically one whole floor of its magnificent building, which was opened at Washington two years ago.

It is not a dead museum, with glass cases and hands-off signs on all sides. You operate these mechanisms yourself, with no guide standing by to restrain or explain. A simple card tells you briefly what the device illustrates, and another, perhaps, how to set it going.

Wandering among these strange-looking devices, I have tried to imagine what the spirt of some wise man of the ancient



© U. & U.

Special Plates and Tubes Which Illustrate Clearly Effect of X-Rays on Body

Copyright, Henry Miller

Another View of Big and Little Electric-Light Bulbs, and Balloon Outfit for Determining Weather Conditions at High Altitudes. The Sphere Is Sent Up Until Expansion of Hydrogen in It Causes It to Explode, the Recording Apparatus Falls Safely to Earth on a Parachute Support and Is Returned to the Weather Bureau, Where Experts Open It and Examine Chart. Explorations by This Means Have Been Made to a Height of Over Nineteen Miles

As Young Woman Speaks into Transmitter, Her Voice Is Reproduced in Visible Record of Curves Showing Sound Waves

Greeks would feel if they were explained to him. I have given myself the pleasure of acting as his guide, and opening to his gaze the vision of a creation unimaginably great and unimaginably small, as set off against the cramped little world in which he moved and thought.

"Do you see this little bulb?" I have fancied myself saying to him. "By its help one man can talk in an ordinary voice and another ten thousand miles away can hear him.

"Here is an artificial eye, far more potent than our natural eye. With it we can look through solid flesh and see the bones of a living body.

"By this machine I can measure and watch in action a pressure so gentle that a man's breath would seem like a raging tornado by the side of it. Across the hall is a set of mirrors which shows me how much I bend an iron bar six inches thick by pressing my thumb down on it.

"If this lamp were connected, I could instantly produce a blaze of light, simply by pressing a button, which would blind you just as the sun would do. It is the largest electric-light bulb ever made, two thousand times as powerful as those we use in our homes for ordinary light. We use it in making pictures that move like people in real life.

"Here is a piece of perfect glass. It is twelve or fourteen inches through, and yet you would have to look sharply, if you did not know it was there, to see that there was anything between your eyes and this pencil I hold on the other side of it. Here is a grating ruled with thousands of fine lines to the inch—so fine that they split a sunbeam into its natural colors. Here is a mechanism that tells us, simply but surely, what a star hundreds of trillions of miles away is made of."

But our visitor from the past would not even know what a star was. To explain any one of these numerous devices fully it would almost be necessary to begin at the beginning and review the whole long line of discoveries of our modern era.

© Henry Miller

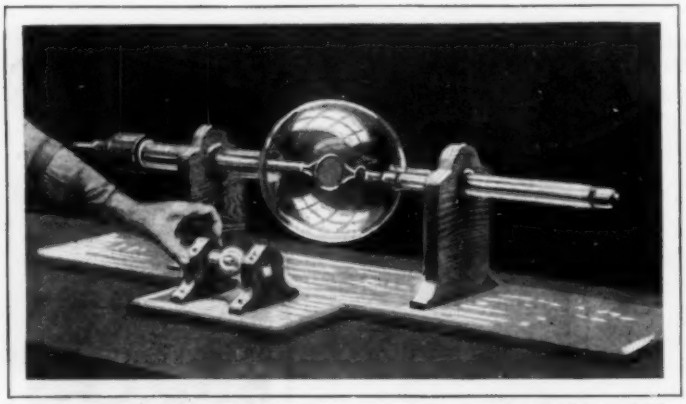
Where the Sun and Its Spots Are Reflected, Formed into a Spectrum and Studied without Injuring Eyes

It will be simpler to describe the more striking of these exhibits as if to a contemporary, to one of the tens of thousands of visitors that throng to the capital city every summer. Even from the outside you will see that this beautiful white-marble palace is like no other of the capital's many fine public structures.

Across the whole front of the building runs an inscription in strange characters. They are Greek, and the inscription means, "The search for truth is in one way hard and in another easy. For it is evident that none can master it fully nor miss it wholly. But each adds a little to our knowledge of Nature and from all facts assembled there arises a certain grandeur."

As we go up the steps and through the entrance halls we have quick evidence that this is no ordinary structure we are visiting. Through a wide doorway we see, in the central hall of the building, something which no other place in the country, perhaps in the world, can show.

Suspended by a long wire from the cen-



Copyright, Henry Miller

Big and Little X-Ray Tubes; the Larger Has Fifteen Times the Output of the Ordinary Kind in Medical Use

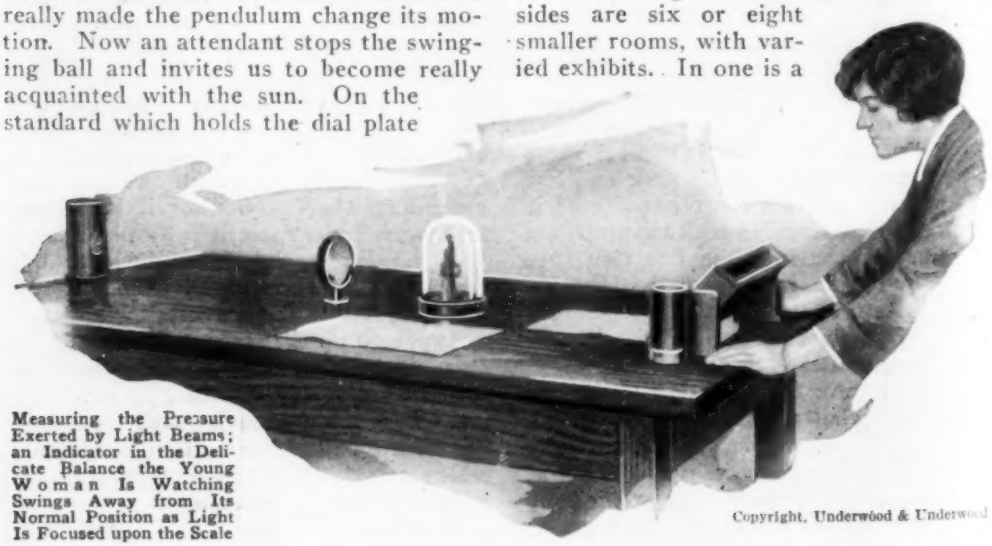
ter of the dome above, a polished brass ball swings silently to and fro. It regulates no clockwork or other machinery, and there seems to be no reason for its motion aside from the mere swinging itself—which is indeed the case.

It is a Foucault pendulum. In 1851, a renowned French scientist, J. B. L. Foucault, set out to demonstrate a law of the pendulum. He suspended a finely adjusted ball, similar to the one in front of us, and set it going. No human hand touched the ball or its wire, no air currents swayed it, yet gradually, inch by inch, it changed the direction of its swing. Or, rather, it did its best to keep swinging always in the same drection. It was the rotation of the earth on its axis that really made the pendulum change its motion. Now an attendant stops the swinging ball and invites us to become really acquainted with the sun. On the standard which holds the dial plate over which the pendulum passes a round white disk. Upon it, if no clouds intervene, the sun presents us with its photographic likeness.

In the center of the dome above is set a mechanism worked by a small motor so that the sun's image is constantly reflected downward in one spot, although the sun itself is moving across the sky. On the surface of the white disk are some little gray flecks of dust. You want to brush them off with your handkerchief. But if you tried that out you would have your difficulties. For each of those flecks is a direct reflection of a mighty whirling storm of solar gases which could swallow a planet many times as large as the earth.

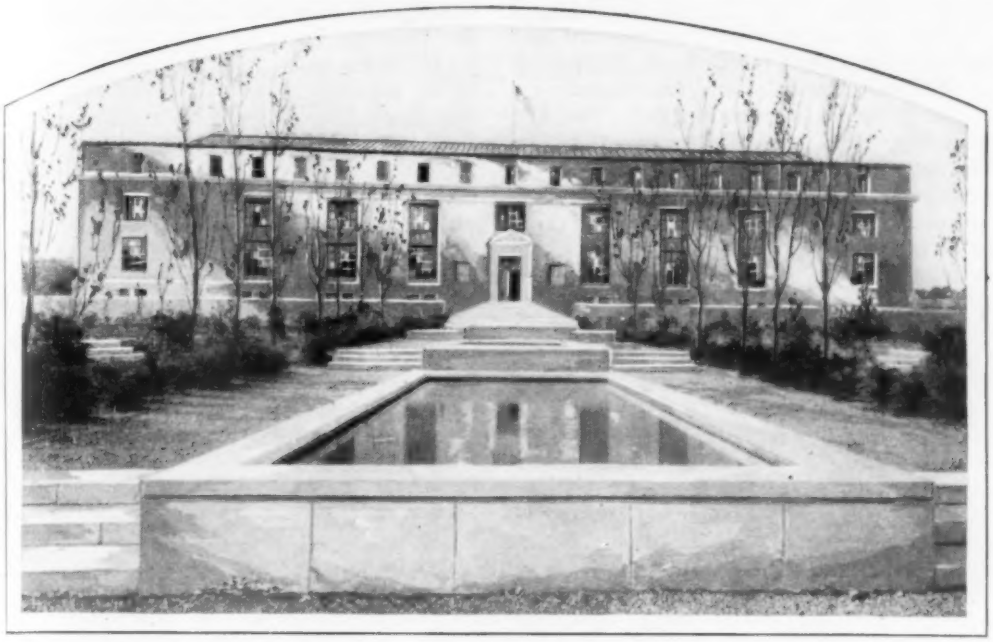
You have heard often of the solar spectrum. By pressing a button and looking in an eyepiece, when the attendant has moved into place a finely ruled metal grating, you see it before you. Brilliant, vivid, glowing, the rainbow bands of color stretch out before you like mighty columns of light. Nothing this wondrous building has to show, I think, is quite so beautiful as this spectrum when the sun is shining brightly.

Surrounding this central hall on three sides are six or eight smaller rooms, with varied exhibits. In one is a



Measuring the Pressure Exerted by Light Beams; an Indicator in the Delicate Balance the Young Woman Is Watching Swings Away from Its Normal Position as Light Is Focused upon the Scale

Copyright, Underwood & Underwood



Copyright, Underwood & Underwood

Exterior of National Academy of Sciences Building, Where Marvelous Exhibition of Instruments Is Housed. The Structure Is Located near Lincoln Memorial

machine that shows us the pressure of light, actually at work. At one end of a table you press a button. A motor starts throbbing, and a small electric light on one corner sends out a beam of light through a slit in the metal cylinder inclosing it. The beam strikes a tiny mirror in the center of the table and is reflected onto a scale at the end of table.

In a moment a powerful light at the other end flashes up. By means of a lens it is focused on the edge of a thin silver plate in the center of the table, suspended by a thread of quartz. Its pressure turns the plate, which twists the quartz thread, to which the mirror is attached. This also turns, and the first-mentioned beam, reflected from the mirror, moves along the scale several inches. The light pressure thus made visible before our eyes is about twenty microdynes, a card tells you, or five ten-billionths of an ounce.

In one corner of the room stands a tall glass tube, three or four inches in diameter. "This," said an attendant, "is really our greatest 'circus' stunt." He switched off the ordinary light and pressed a button which lighted up the tube with a beautiful, soft, violet glow.

"Look at my teeth," he said and grinned broadly. The two rows of teeth shone out as if covered with phosphorus—except one false tooth, which was black. He took a handful of silver coins from his pocket. They were darkly tarnished, like a silver teapot that has stood long unpolished. He pointed to a screen of colored flowers. They too glowed with phosphorescent light, and continued to do so even when the light from the tube was switched off. A ghastly blue haze hung through all the air around, but disappeared when I held a card between my eyes and the lighted tube.

This, in short, was the ultraviolet light which stage magicians have learned to use to produce weird effects, and which our darkened ships employed to send each other signals quite invisible to the lurking submarines of the nights of 1918.

We must hurry on. But we must not pass by this long, black, boxlike tube on our right. It illustrates what may well turn out to be one of the most significant discoveries in our efforts to form a conception of the grouping of the innumerable star suns around us.

It was the great Herschel who suggested, more than a century ago, that the spiral

nebulæ might really be vast assemblages of stars, so far off that they seemed like light clouds in our telescopes. He coined for them the term "island universes."

But it was a suggestion only, and the evidence, until recently, seemed to be tending against the idea. It was only a year or so ago that Dr. Edwin Hubble announced from the Mt. Wilson observatory in California that he had fairly conclusive proof that these nebulæ really were great universes of suns.

In the edge of the largest and brightest of the spirals, that in Andromeda, Dr. Hubble, with the aid of the giant 100-inch reflector at Mt. Wilson, had been able to resolve the misty light into separate individual stars. Among them were some which varied regularly in brightness, in precisely the same manner and over the same periods as certain variable stars in our own galaxy, or universe.

The faintness of the variables in the edge of the Andromeda spiral indicated that they were somewhere near a million light years away, far too great a distance for them to be included in our own system. They must therefore belong to another universe, that of the spiral formation itself. It is awe-inspiring to remember that there are estimated to be some 700,000 or 800,000 spiral nebulæ in the skies. Each one presumably is a separate universe containing billions of suns.

From the sublime to the ridiculous is only a step. As we pass again into the central hall we find ourselves suddenly in the company of a group of high-school boys and girls talking all sorts of foolery into a mouthpiece. They are really watching the sound waves of their own voices.

Many things in this temple of science we have not touched upon. But certainly there is enough to make us appreciate more fully than before the profound meaning in the inscription around the dome:

"To Science, Pilot of Industry, Conqueror of Disease, Multiplier of the Harvest, Explorer of the Universe, Revealer of Nature's Laws Eternal Guide to Truth."

SINGLE CRYSTAL OF COPPER SEVENTEEN INCHES LONG

Weighing slightly more than twelve pounds, seventeen inches long and two and one-eighth inches in diameter, a single crystal of copper has been prepared at an eastern research laboratory. It was withdrawn from the furnace at the rate of but a quarter of an inch an hour to permit the atoms to arrange themselves in regular manner throughout the entire piece. One of the outstanding properties of the single-crystal copper is that it will conduct electricity thirteen per cent more efficiently than the ordinary metal, which is composed of tiny crystals in chaotic arrangement. Another property of the single crystal is that a rod of it is easily bent, but when this is done, it is immediately broken up into small crystals and becomes as hard to bend as ordinary copper.

One of the Magic Products of the Scientist's Laboratory, a Single Crystal of Copper

FIRST ENGINE USED BY EDISON STILL IN SERVICE

The original steam engine used by Edison in 1881 to make electrical current for lighting purposes is still in daily service at a laundry in Mount Carmel, Pa. It is said to be in good condition and is the sole means of operating the plant's heavy machinery. Edison drew up the specifications for it and made the installation. Mount Carmel was the second town in the world to be electrically lighted. It was equipped shortly after a system had been installed at Sunbury.

LETTERS TO EGYPTIAN KING ARE BROUGHT TO LIGHT

At Upper Left, Queen Tiy, Mother of Akhnaton, King of the Egyptians, Appearing at Right; and Below, the Letters, Written in Cuneiform Script on Clay Tablets

Courtesy American Museum of Art

Dating back more than 3,000 years, a series of letters have been found written on tablets of clay, which are as well preserved as if composed yesterday. They are known as the Amarna letters and two of the series of letters addressed to the Egyptian ruler of the time have been acquired by the Metropolitan Museum of Art. The letters written to Akhnaton, who was known as the heretic king, are of special interest as they are almost the only source of our knowledge of ancient near-east diplomacy, especially as regards the relations of Egypt with her neighbors of Asia. They were written on clay tablets which measure only a few inches in the largest dimension. The script is the so-called cuneiform or wedge-shaped writing, each tiny wedge being made by the scribe in the soft clay with the end of a reed stylus. After the letters were written in enduring form, they were baked hard and the writing was thus preserved for centuries. One of the letters has been translated and reads as follows:

"To the King of Egypt thus speaks Ashur-uballit, King of Assyria: May it be well with thee, thy house, thy wives, thy chariots, and thy warriors! I have sent my messenger to thee in order to see thee and to see thy land. That which my father hath not sent have I now sent to thee. One splendid chariot, two horses and one . . . . of beautiful lapis lazuli have I sent to thee as thy gift. The messenger whom I have sent to thee to see . . . . let him see and then go! Thy desire and the desire of thy land let him learn and then go!"

SUN SHINING THROUGH BOTTLE STARTS FOREST FIRE

Empty pop bottles have been instrumental in starting forest fires in the California preserves, it is reported. The glass acts as a magnifier, concentrating the sun's rays and, if the heat is sufficiently intense and dry grass is near, a small blaze is started that may rapidly develop into a serious fire. Airplane-patrol service forces have been made aware of this added hazard and take extra care in surveying sections visited by tourists.

John Merton Wearing Suit, Shoes and Hat Woven of Cornhusks, Dyed to Produce Design

SUIT AND SHOES OF CORNHUSKS COST TWENTY CENTS

At an expense of only twenty cents for thread, a Missouri man has made himself a suit, hat and pair of shoes from cornhusks. The material was cut in strips and woven into a sort of fabric. A design was worked in pieces dyed red and blue. The question of buttons for the coat was solved by using corncobs.

LOCK HANDLE FOR MILK CANS ELIMINATES USE OF WIRE

As a substitute for cumbersome wiring, or other methods of fastening, a milk-can cover, lately introduced, has a handle that locks securely to the edges of the container and will not come off unless released in the regular way. This is done by pulling the handle. To lock the top, one of the lugs on the cover is placed in a slot on the can and the other side is pressed down firmly. This arrangement protects the contents in case of accident.

MONKEYS CAPTURED WITH RUM BY AFRICAN NATIVES

An easy way to capture monkeys has been discovered by African bushmen. They place a bottle of native liquor under a tree where the monkeys play. The animals, attracted by the odor, drink and become intoxicated, then fall asleep. They awake in cages. Twenty-nine taken in this way were recently brought to this country by George M. Bistany of the Bronx zoo. He declared that they dance, play and sometimes fight when under the influence of the drink.

CODE CHECK FOR RESTAURANTS HELPS KEEP ACCOUNTS

Most restaurant pay checks simply state the amount due from the patron, but a special form, recently devised, is intended to show which dishes are the most popular and how much is being spent for that particular article. In addition to punching the total due to the cashier, the waiter perforates the slip at the names of the various kinds of food. These are conveniently arranged and cover practically every item likely to be included in the restaurant menu. For table service, a hand punch is employed. At counters, a special perforator with a holder for a pad of checks is placed where it is accessible to several attendants.

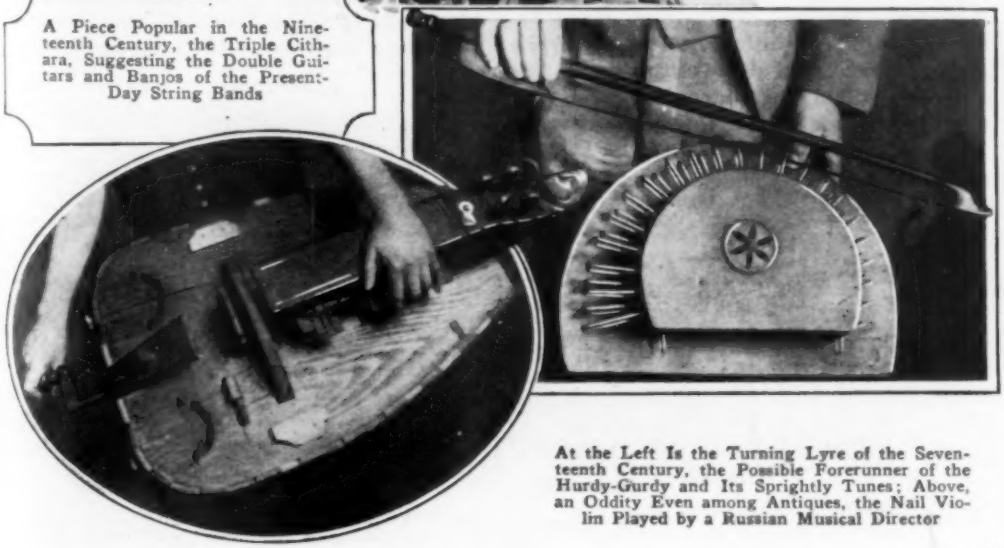
ELECTRICITY DRIES DATES

Moisture absorbed by dates after picking, is removed at a western packing plant by placing the fruit on trays in small rooms into which electrically heated air is blown under slight pressure. The system is said to have been helpful last season because late rains threatened to spoil much of the crop.

THE JAZZ-MUSIC MAKERS OF OTHER DAYS

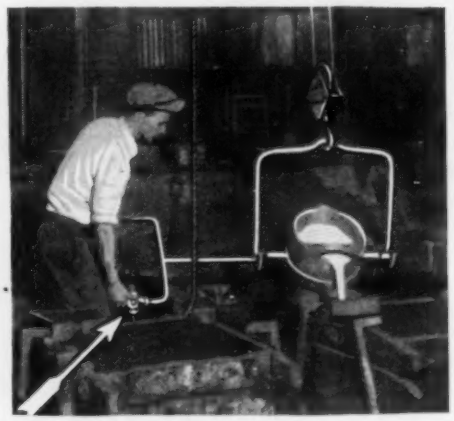
Upper Left, Jazz Band in One Instrument; It Has Seven Sounding Horns and Two Keyboards; Right, Glass Harmonica, Revolving Units Played with Rosined Fingers

A Piece Popular in the Nineteenth Century, the Triple Cithara, Suggesting the Double Guitars and Banjos of the Present-Day String Bands



At the Left Is the Turning Lyre of the Seventeenth Century, the Possible Forerunner of the Hurdy-Gurdy and Its Sprightly Tunes; Above, an Oddity Even among Antiques, the Nail Violin Played by a Russian Musical Director

PUSH-BUTTON METAL LADLE CONTROLLED BY ONE MAN



Pouring a Ladle of Molten Metal from Suspended Carrier Equipped with Handlebars to Simplify Operation

Running on a rail attached to the ceiling of the foundry, a metal pouring ladle now on the market can be raised by means of a push-button control attached to the handlebars beneath the operator's thumb so that it can be manipulated by one man. The carrier can be pushed by hand or moved electrically.

CROSS-COUNTRY RACING AUTO HAS PROTECTED TIRES

Designed for traversing rough country as well as for speed, a Belgian racing car combined several interesting features. Heavy mudguard protectors for the wheels were conspicuous and the auto's lines were calculated to decrease wind resistance. The tires were shielded as much as possible to prevent punctures, as the course of the race lay far from repair stations.

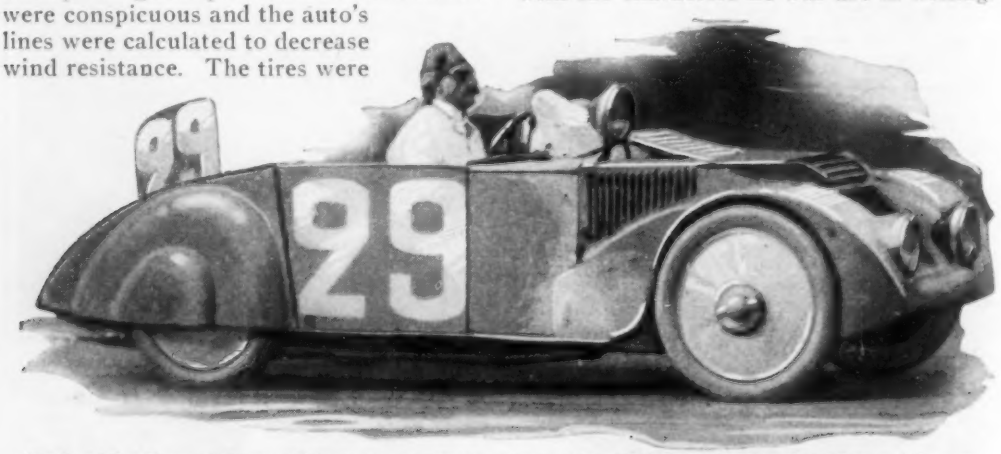
SAFE SUBSTITUTE FOR IODINE IS NON-POISONOUS

Potassium permanganate is being recommended as a satisfactory substitute for iodine in treating cuts and bruises. It is said not to burn or smart on application, keeps indefinitely in the dry state and eliminates the danger of overdoses, as it is not poisonous. For ordinary usage, half a teaspoonful of the crystals dissolved in a cup of water is sufficient, but a teaspoonful is recommended for ivy poisoning. In severe cases, such as snake bite, the dry crystals are pressed directly into the wound or into small incisions about it.

GAME OF LETTERS AIDS YOUNG IN LEARNING TO WRITE

© C. A. Oldroyd

Formation of letters and words is made an interesting and instructive game with a set of cut-out pieces of thirteen different shapes. There are ninety-eight units to the outfit, from which nearly 250,000 words can be spelled. The pieces are of durable material and form letters in script, not in the usual capital styles of the ordinary blocks, so that the child becomes familiar with the characters he will use in writing.



Designed for Heavy Going as Well as Speed; Belgian Racing Automobile with Its Guarded Tires and Streamline Body to Decrease Wind Resistance; Note the Protected Headlights and "Spot" near Driver

KLIEG LIGHT MADE HARMLESS BY SCREEN

Injurious effects to the eyes caused by the short violet rays from the lights used in motion-picture studios, can be avoided, the bureau of standards has suggested, by placing a screen of glass in front of the arcs. This shield is to contain a small percentage of a chemical, cerium oxide, and is intended to absorb the short light rays that injure the vision. A sheet of common window glass, about one-fourth of an inch thick, would prevent some of the harmful rays from reaching the eyes, the investigators declared, but the specially treated screen was found more effective. Adoption of the suggestion would necessitate the use of white or yellow-flame carbon electrodes in the arc lights and the film would have to be prepared in such a manner as to become sensitive to the red and yellow region of the spectrum the bureau scientists believe.

Fashioning Molds of Famous Lincoln Statue Directly from the Bronze in Chicago Park; Plaster Was Removed in Sections

SCREWDRIVER OF SEVEN EDGES FITS ON KEY RING

Seven working edges, ranging from one-eighth to three-fourths of an inch in width, give a key-ring screwdriver now on the market more than ordinary usefulness. It is all metal and the part corresponding to the handle affords wrenchlike turning leverage so that it is almost as effective as a larger tool and will function in difficult places where the common type could not easily be used.

CAST OF LINCOLN MONUMENT MADE IN OUTDOOR STUDIO

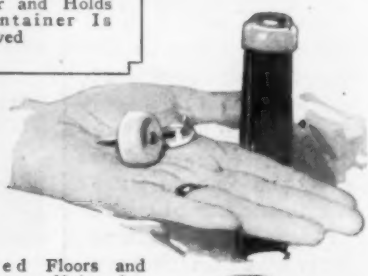
Because the original molds could not be found, craftsmen prepared a duplicate of the famous St. Gaudens statue of Lincoln for the sesquicentennial exposition, directly from the bronze monument in Lincoln park, Chicago. An outdoor studio was constructed of canvas and scaffolding and the plaster casts molded in sections, preparatory to making the copy of the figure. This statue, showing the great president standing, was unveiled in 1887 and is the better known of the two Lincoln monuments by St. Gaudens in Chicago. In the other the figure is seated. It was recently erected in Grant park.

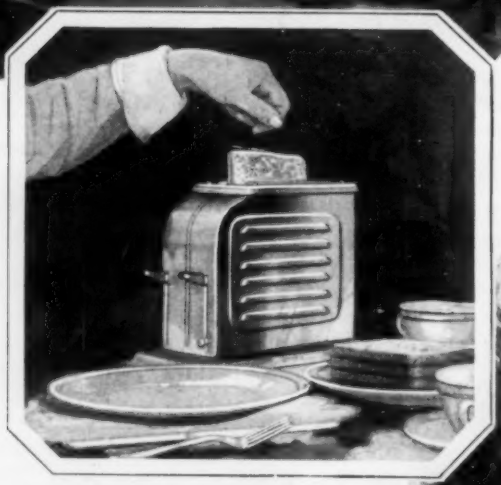
¶Natives of Africa use 800 languages and dialects.

To Save Work

Rubber Safety Handle on Electric-Cord Plug, Prevents Shocks and Burns and Reduces Breakage of Wires

For Lifting Ice-Cream Cans, This Handle Clamp Grips the Raised Collar and Holds Tightly as Container Is Removed





Automatic Toaster Shuts Off Current When Bread Is Browned Sufficiently, Saving Electricity and Scorching; Levers at Side Regulate the Operation

Marred Floors and Bothersome Noise Are Eliminated by Using This Rubber-Insulated Chair Tip

Combination Cleaning Crayon and Chemical Brush Pad for Removing All Kinds of Spots

Gas Suppl. for Cooking, in Cylinders Outside of House

Anyone wishing further information on devices described in the editorial pages can

in Your Home

Strainer and Immerser for Cooking Greens Fits on Saucepan Rim

Electric Water Purifier of Convenient Home Size, Operates from Lamp Socket and Is Said to Remove Chlorine Taste and Odor While Consuming but Little Current

Traveling Dining Room for the Birds; This Sheltered Feed House, Suspended on Cable, Is Drawn In for Filling, Then Pulled Back, Away from House Where Birds May Gather without Fear

Sore Knees Are Prevented While Scrubbing Floors by This Soft-Rubbber Pad Which Also Protects Clothing

Electric Heating Unit for Liquids Slips into Basin

obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago

Drawing, Showing Housewife Using Microphone Installation to Call Maid, and Diagram of Circuit

MICROPHONE FOR HOME USE SUBSTITUTE FOR BUZZER

Essentially like the microphone used in radio transmission, a small unit for home or office saves steps and the confusion that often results from a buzzer. The operator speaks his orders into it just as he would into a telephone mouthpiece. Servants or clerks thus learn what is wanted without having to make a trip in response to the signal. The outfit is simple to install and may be connected to the buzzer wires already in use. A battery of not more than six volts should be used, in order to prevent burning out the carbon in the transmitter.

COSTLY CHINESE DRUG MADE BY SYNTHETIC PROCESS

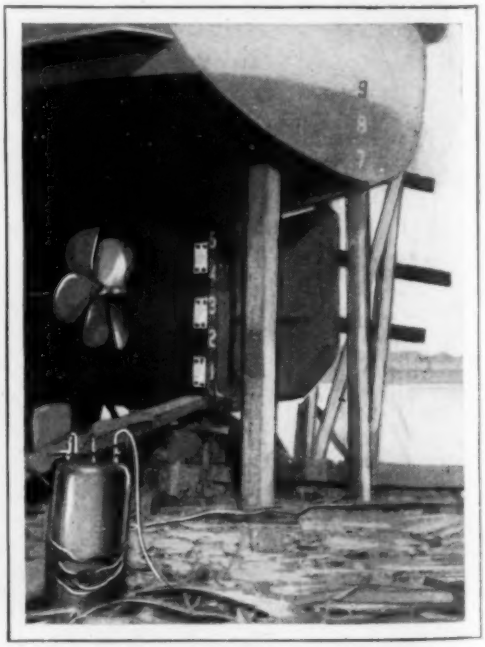
Solution of a medical riddle that has perplexed investigators for more than forty years is reported from the university of Illinois in the discovery of a process for making ephedrin, a valued Chinese drug, synthetically. In the natural state, the product is obtained from a plant and is considered beneficial in treating nasal troubles and as a substitute for adrenalin. High costs prevented marketing it extensively and, during the last twenty years, many efforts had been made to prepare the drug by chemical processes.

GLACIER RAZES HIGH MOUNTAIN IN ALASKAN RANGE

Clouds of what appeared to be smoke, rising from a peak not far from Cordova, Alaska, led to reports that a volcano was in action. Investigation showed that there was no eruption, however, for the supposed smoke was dust caused by slides of soft shale from a mountain 3,000 feet high being pushed over by a glacier. The ice mass had changed direction. Its terrific pressure against the base of the spur had dislodged the upper strata. It is believed that the lofty peak, in time, will be reduced to a mere hill.

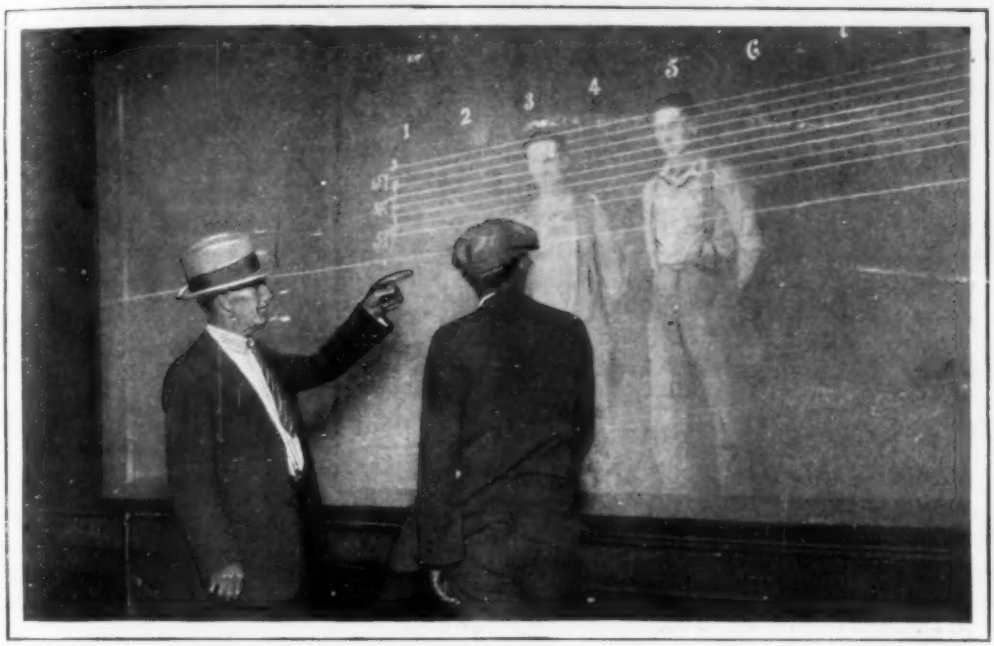
CORROSION PLATES FOR SHIPS PROTECT STEEL HULL

To prolong the life of the steel hulls of vessels, zinc plates, bolted to the keel opposite the propeller are said to be effective. They take up the chemical action produced by the blades revolving in contact with the salt water, an effect similar to that which occurs in a wet-cell battery. The zinc units function as positive plates so that the corrosion on the steel is minimized. The strips last several years.



Protecting Plates Are White Squares to Left of Figures on Hull; They Prevent Corrosion

SHADOW BOX FOR PRISONERS TO END THIRD DEGREE



Questioning Men behind the Shadow Screen; There Is a Numbered Space for Each, and Cross Lines Give Height Measurements; Suspects Cannot See Their Questioners

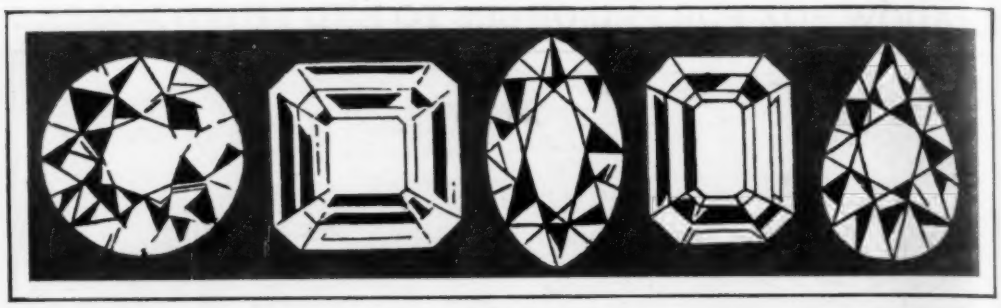
As a substitute for violent third-degree tactics, Los Angeles police have been using a shadow box in questioning suspects. Prisoners stand on a low stage, with a curtain in front, and lights are so arranged that the persons on the platform cannot see anyone on the other side of the drop, but the police have a clear view of the suspects' faces and can study their mannerisms and movements unwittingly revealed. It is thought that this arrangement may help in obtaining confessions from prisoners, as the men are not so likely to assume the mask of defiance or indifference which has often been found hard to break in an open interview.

PRESENT TYPE OF STEEL HAT BEST HEAD PROTECTOR

"Tin hats" of the type used during the war to protect the heads of American soldiers from rifle bullets and shrapnel are not to be discarded by the army, according to a recent announcement, as they have been found more efficient than other styles. Experiments were made with helmets similar to those used by spearmen in medieval days, with others like the Germans wore and still others resembling the helmets worn by the Crusaders. Under strenuous tests with machine-gun and rifle fire, the present type proved superior, according to the findings of the infantry board, and recommendations were made that this kind be retained.

SPECIAL AUTO-CHASSIS OILERS SIMPLIFY LUBRICATION

Oiling the auto chassis with one hand and in a few minutes is said to be simple with the aid of special valve oil cups and an improved can. Motor oil is used instead of grease, the cups being fitted with a valve which supplies the lubricant as needed. The spout of the can is shaped so that the cup lid can be opened with it, flushing and filling the holder with one easy motion.



Five Standard Ways of Cutting a Diamond; from Left to Right, Round Brilliant, Emerald-Cut (Square), Marquis, Emerald-Cut (Oblong), and the Pendeloque, Popularly Known as Pear-Shaped

Diamond Digging in the Wilds

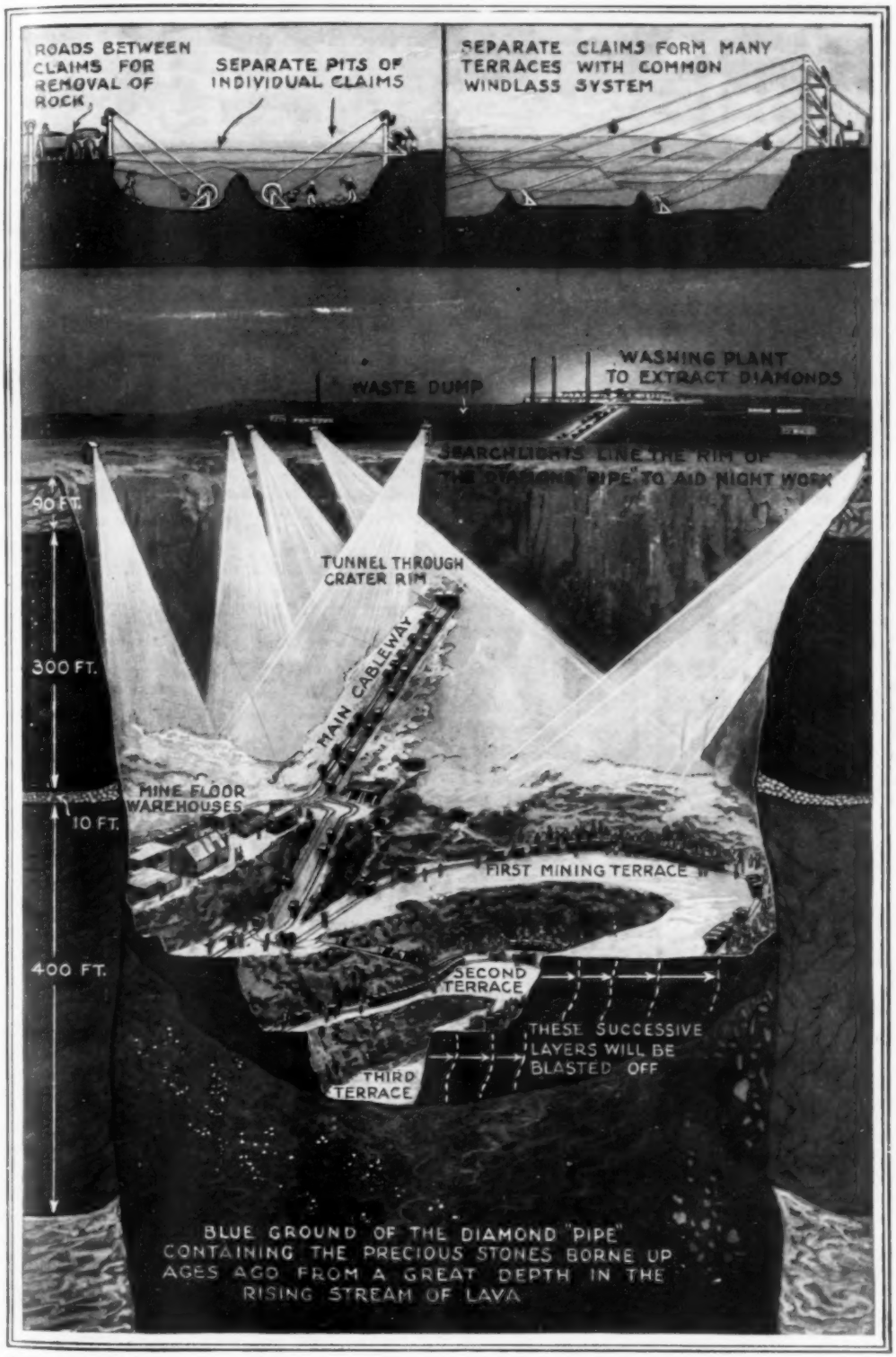
Strange Stories and Tragedies of the World-Old Search for the Queen of Gems

ONE of the strangest mile-long foot races ever run was staged one day last spring when thousands of men and women toed the mark under a blazing south African sun waiting for the starting gun in a dash which brought to a few great fortune and to the vast majority bitter disappointment. The occasion was the opening of a new diamond field. For miles along the sun-parched veldt, the hordes had gathered, coming by automobile, buggy, huge Boer vans drawn by oxen, lumbering plains wagons and on foot. They met in a desolate land where hardly a blade of grass or a stunted bush could be found. There were no wells or springs for miles, and hucksters selling water in small casks at $1 each did a land-office business.

A mile away lay the future diamond mines, a roughly circular bed of blue clay extending down to unknown depths—a true "diamond pipe," once the vent of some long-extinct volcano through which the boiling blue-clay mud had simmered up from below. Each man and woman along the starting line, toeing the mark laid down by the wardens, carried four small stakes to mark the corners of the hoped-for claim.

Diamond Sorters with a Vast Fortune in the Rough Dumped on the Table before Them; a Scene from a Diamond Mine

The reason for the stampede, which drew workers from other diamond fields, farmers from the veldt and clerks and adventurers from distant cities, was the accidental discovery of $70,000 worth of diamonds, lying on the open ground. The government opened the pipe for mining, and

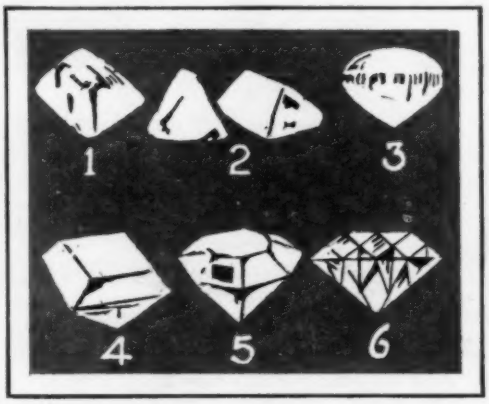

ROADS BETWEEN CLAIMS FOR REMOVAL OF ROCK
SEPARATE PITS OF INDIVIDUAL CLAIMS
SEPARATE CLAIMS FORM MANY TERRACES WITH COMMON WINDLASS SYSTEM
WASTE DUMP
WASHING PLANT TO EXTRACT DIAMONDS
SEARCHLIGHTS LINE THE RIM OF THE "DIAMOND" PIPE TO AID NIGHT WORK
90 FT.
300 FT.
10 FT.
400 FT.
TUNNEL THROUGH CRATER RIM
MAIN CABLEWAY
MINE FLOOR WAREHOUSES
FIRST MINING TERRACE
SECOND TERRACE
THIRD TERRACE
THESE SUCCESSIVE LAYERS WILL BE BLASTED OFF
BLUE GROUND OF THE DIAMOND "PIPE" CONTAINING THE PRECIOUS STONES BORNE UP AGES AGO FROM A GREAT DEPTH IN THE RISING STREAM OF LAVA

© S. W. Clatsworthy

laid down the rules for claims. Eventually all the separate claims probably will be sold to one of the big operators and merged in one, for bucking the world's diamond syndicate is a losing game. The supply of diamonds on the market is strictly limited to what the world can absorb, in order to keep up the prices.

Diamond mining is like no other form of wealth extraction. The south African mines, richest ever found, are invariably the "pipes" through which the crystallized carbon, manufactured in the intense heat of the center of the earth and compressed under the vast weight of the surface land, was forced upward along with boiling blue mud, to cool and remain for untold centuries until accidental discovery by man. The diamonds found in this country, in the Ozarks of Missouri and Arkansas, are of entirely different origin, appearing usually in mountain-stream beds. Where they came from no one knows.

Once a pipe is found and the first claims staked out, the work of getting out the soft clay begins. As dug from the mine it is of puttylike consistency, but when dried and rotted in the sun it can be crumbled and washed away. Portions of the diamond-bearing clay are left between the claims at the start, to serve as roads over which the mined earth can be hauled to the drying grounds. Later the roads are blasted away, tall spars erected all around the deepening pit, and tramway buckets, running down to each claim, haul the material to the surface. A big pipe is covered by a network of tramway lines, each individually owned.



Stages in Cutting: Rough Diamond, Rough-Sawed, First Shaping, Lopped Four-Square, Eight-Square and the Finished Brilliant

System arrives when the big operators step in, buy up and consolidate all the claims. In the center of the pipe they sink a fifty-foot pit, and begin blasting away its sides, working steadily outward toward the rim. When the work has progressed far enough, another pit is sunk, and a second terrace started, followed later by a third, and if the pit is large enough, even more.

Electric railways replace the crude aerial skips, and tunnels are driven through the rim rock to form an easy grade to the drying fields and the washing plant. Giant searchlights, spotted about the rim, light the mine by night, so that work never ceases. Fences, electrically charged, armed guards, barbed-wire entanglements and other safety measures discourage thefts, and the workers, usually natives enlisted for periods of months or a year, are herded into fenced villages, searched night and morning, and guarded as closely as though in prison.

South Africa has strict laws against illicit diamond buying, but in spite of laws and the precautions taken, "I.D.B's.," as the buyers are called, continue to flourish, for a stone worth thousands, even in the rough, is easily hidden and hard to find.

One of the largest of the diamond mines—the Premier, of Wesselton—was not so very long ago a rubbish heap for a near-by township. How the diamonds are extracted is an interesting story. The blue clay holding the gems is dumped into bins and conveyed in electrically driven cars, runing on an endless track, to the floors of the receiving grounds. In the famous de Beers mines, these grounds stretch for four miles, and each floor can take 50,000 truck loads. In this clay, the rough diamonds may be as big as walnuts, but they are invisible even to people walking over the ground.

Now, the blue stuff is broken up and hauled to washing machines. There revolving arms on a vertical shaft, tipped with great steel teeth, force the diamonds to one side, while the thin mud is shot from the center through an outlet. The diamonds are put into trucks with locked

Kaffir Workers Washing Diamonds Out of the Blue Earth at a Crude Diamond Mine; in the Big Syndicate Plants This Is Done by Machines That Automatically Rescue Every Tiny Stone

covers, and taken to the pulsator, to be sifted into five sizes.

A curious story is told of the origin of this diamond searcher or "greased pulsator," which is an agitated canvas unerringly picking out gems from the dirt passed over it. An engine man was oiling machinery when he happened to thrust his greasy hand into a heap of crushed blue clay. On going to wash his hands, he found the blue dirt had vanished, leaving the diamonds sticking to the grease on his hands. This was the origin of the pulsator which does not miss a diamond even if no larger than a pin's head.

When the diamonds have been separated, an armed guard takes them from the sorting table to the general offices of the mine where they are handed over to the valuators. These experts clean the gems by boiling them in nitric and hydrochloric acids.

Now comes the business of sorting the stones, in size, color and purity, before shipping them to New York or London. The finest stones are known as "pure goods, brown goods and spotted goods." Next in value come those known as "pure cleavage, broken stones, naats or manacles," and lastly the flat triangular crystals called "bort" or "carbonado" without which America would never have had the Panama canal, bort being used to point the diamond rock cutters and drills for the excavation of the Culebra cut.

The purest diamonds scintillate with brilliant prismatic hues, and are colorless, transparent crystals known as "white stones." But they are very rarely found, for more often the digger finds them "smoked" with brown, gray and yellow tints, showing that mineral impurities are imprisoned in the crystals. Nevertheless, an impure diamond may be many times more valuable than a pure one, if it shows a red, green or blue glow. But these colored diamonds are not popular with the digger because they resemble the bits of colored and valueless quartz he daily throws away, and when he does find a colored or "mongrel diamond" he torments himself with the thought that he may have

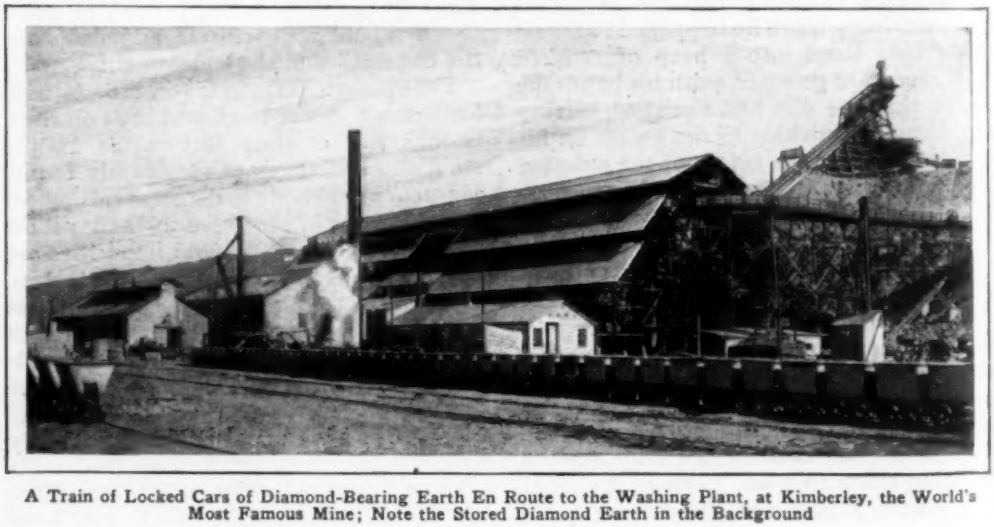
cast on to the scrap heap many like it. "A blue diamond," said a digger recently, "pinches the pipe," meaning that the promising pipe or bed of stones, will yield no more valuable gems after a blue diamond has been found.

One can make the diamond radioactive so that it will shine in the dark and turn olive green in hue. The method of doing this is to imbed the stone in radium bromide, and the luminosity lasts for twenty years. Diamonds will also shine in a dark room after they have been exposed to sunlight. Sir William Crookes exposed a diamond to a high-tension electrical charge, passed through a vacuum tube, and found it phosphorescing in brilliant colors.

Many of the most famous diamonds are associated with stories of stark tragedy, and shrouded by superstition that they bring bad luck. Take the famous Regent or Pitt diamond which now dazzles the eyes of women who see it under a glass case in the salons of the Louvre, Paris. It was found by a slave in the Parteal mines of India, 225 years ago. To hide it, he cut his leg and concealed the stone in the bandages. It was a 410-carat gem of priceless value, and the slave ran for the coast, where he crept on board a ship, giving the English skipper the diamond in return for his liberty and a small sum. Once out at sea, the skipper threw the poor slave overboard, and later sold the diamond for $5,000 to a prominent dealer. The captain spent his ill-gotten loot in drink and died in delirium. From the dealer, the diamond passed to Thomas Pitt, governor of the Anglo-Indian Fort St. George, who paid $81,600 for it. Pitt cut the stone and had it polished at a cost of $25,000, selling the dust alone for $75,000. Then it became a French crown jewel, and when the revolution broke out, it was hidden in a ditch, but a thief revealed its whereabouts to save himself from being guillotined. Napoleon Bonaparte used the gem to raise a loan from the Dutch government.

The Orloff diamond (194 carats) was stolen by a French sailor from the eye of an idol in a Brahmin temple. From him, it was stolen by a ship's captain who murdered him to get possession of the great jewel. Finally, Prince Orloff bought it for $4,500,000 and presented it to Catherine the Great of Russia. Then there is the ravishing Sancy diamond of 53 carats, last known to be in the palace of an Indian prince. It passed successively through the hands of Charles the Bold, de Sancy, the queens Elizabeth and Henrietta Maria of England, Cardinal Mazarin, and Louis XIV. It was stolen in the French revolution, but came to light in the hands of a king of Spain, from whom it went to a Russian prince.

The Nizam of Hyderabad paid $2,000,000 for the famous Victoria diamond, which weighed 180 carats. But the largest diamond ever found is the Cullinan gem of 3,025 carats, from the Premier mines.



A Train of Locked Cars of Diamond-Bearing Earth En Route to the Washing Plant, at Kimberley, the World's Most Famous Mine; Note the Stored Diamond Earth in the Background

RUMBLE FROM OCEAN'S FLOOR CLUE TO LOST SHIP?

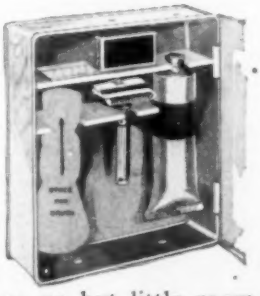
Can sunken ships be located by means of the noise they produce in scraping over the ocean's floor? The possibility is suggested in an odd discovery by Lieut. T. J. Maher while making government coast surveys at the mouth of the Columbia river. A continual rumble was noted in one of the delicate sound-recording instruments being used to determine the depth of the waters. The gauge was taken apart, thoroughly inspected and reassembled to make sure that the noise was not caused by a defect, but the rumble continued. Lieut. Maher decided that the sounds likely were produced by the grating of a ship's hull on the floor of the sea. Search of the records furnished no clue to any ship sunk at that place, but it was decided to use drag lines to establish the source of the sounds.

Prince of Wales beside Bison Statue Presented to British Boy Scouts in Memory of Unknown Lad Who Helped American Tourist

UNKNOWN BRITISH BOY SCOUT HONORED BY AMERICANS

Years ago, an unknown boy scout helped an American tourist. His kindly action is reported to have led indirectly to the establishment of the scouts in the United States. In memory of this lad, a bronze statuette of a bison was presented last Fourth of July to the scouts of Great Britain from those of America. It was received from Ambassador Houghton by the Prince of Wales on behalf of the British organization. The monument stands in Gilwell park, near London.

SHAVING BOX FOR TRAVELER HOLDS COMPLETE OUTFIT



Many so-called pocket shaving outfits carry only part of a set, but a metal, marble-finished cabinet now on the market has space for razor and extra blades, cream and brush too. The entire assembly takes up but little room in the traveling bag.

¶We want all our readers to write us freely and often whenever they wish additional information on articles published in this magazine. Address Bureau of Information, Popular Mechanics, Chicago.

CEMENT IS TESTED WITH FOGS PRODUCED IN LABORATORY

Fogs rivaling those occurring in nature are directed against cement samples in a laboratory for testing and curing the material. The room is equipped with atomizers which blow a current of compressed air through a stream of water. The thin mist created can be regulated to varying degrees of density. A steel door prevents the fog from entering adjoining rooms.

Where Fun and Instruction Are Combined; Clown Giving Children a Lesson in Fire Prevention and Hazards of Matches

CLOWN AS CHILDREN'S TEACHER WARNS OF FIRE DANGERS

School children receive impressive lessons in the perils of fire, and the best ways to prevent them, from lectures delivered by an expert in clown costume. To illustrate his points, he uses a miniature fire engine and two gigantic matches.

HIVE OF BEES KEPT IN OFFICE TO STUDY INSECTS' WAYS

Interesting records of bees' activities are kept by a college professor who has a hive of them in his office. A hole in the window sash provides access to the box which rests on carefully adjusted scales connected to an automatic recorder. Temperature, barometric-pressure and percentage-of-sunshine figures are also kept. From this information charts are prepared, showing the movements of the bees from day to day and month to month. On sunny mornings, the weight of the hive drops about two pounds between eight and eight-thirty o'clock. That is the time when some 10,000 bees go forth on the first foraging expedition of the day. As they return, the weight increases five or six pounds, reaching the heaviest point at sunset. This is partly due to the presence of the bees and to the large amount of water in the nectar. The workers get rid of much of this by vigorous fanning with their wings. In the afternoons, when the sun shines, there is another drop in weight as the young bees leave for half an hour or so of exercise. Other slight drops, which are not regained, occur when large numbers of old bees die. Many are tempted out by the first warm days and have not strength enough to return. Sometimes 500 or 600 will die in the path of duty daily. One of the mysteries in the life of the bees is how they are able to anticipate the approach of a rain. About fifteen minutes before a shower, they come flying home, sometimes as many as 7,000 pouring through the narrow opening to the hive in ten minutes and looking like a cyclonic funnel as they do so. The shadow of the clouds or cooler air may give them warning, some investigators believe.

Motorcycle Shield Adjusted, Showing How It Protects Legs as Well as Face and Shoulders

CELLULOID GUARD SHIELDS RIDER'S WHOLE BODY

With celluloid windows and a strong sheet-iron frame, a shield for the motorcycle rider guards his entire body from rain, snow and wind. It is intended to afford unobstructed vision and will not interfere with the operation.

This Set Tunes from Fifteen to 550 Meters

By FRANK L. BRITTIN

ONE of the most interesting receivers Popular Mechanics radio laboratory has ever experimented with, is a simple three-tube set employing five interchangeable coils of the plug-in type. Bringing in distant stations on the short rebroadcast waves in the daylight as well as after dark, with great volume on the loud speaker, this set proved a real surprise. But it can be instantly changed over for the standard broadcast wavelengths as well by merely changing the coils.

Several of the larger broadcasting stations in this country as well as abroad are now sending their programs on two separate wavelengths. For example KDKA, Pittsburgh, operates on a regular wavelength of 309 meters and at certain times rebroadcasts the same program on 64 meters so that it may be picked up by its sister station KFKX, Hastings, Nebr., and rebroadcast on 288 meters. The short waves do not seem to be greatly affected by daylight or atmospheric disturbances and cover a very wide range, often being picked up in south Africa with good volume on amateur short-wave receivers. WGY, Schenectady, N. Y., broadcasts experimental programs at irregular intervals on waves between 15 and 105 meters; 2YT, Poldhu, Ireland, on about 94 meters with experimental programs, and G2-NM, London, on about 44 meters, is often heard after 11:00 p.m. Several of the Australian, European and South American stations may also be heard on waves between 30 and 50 meters.

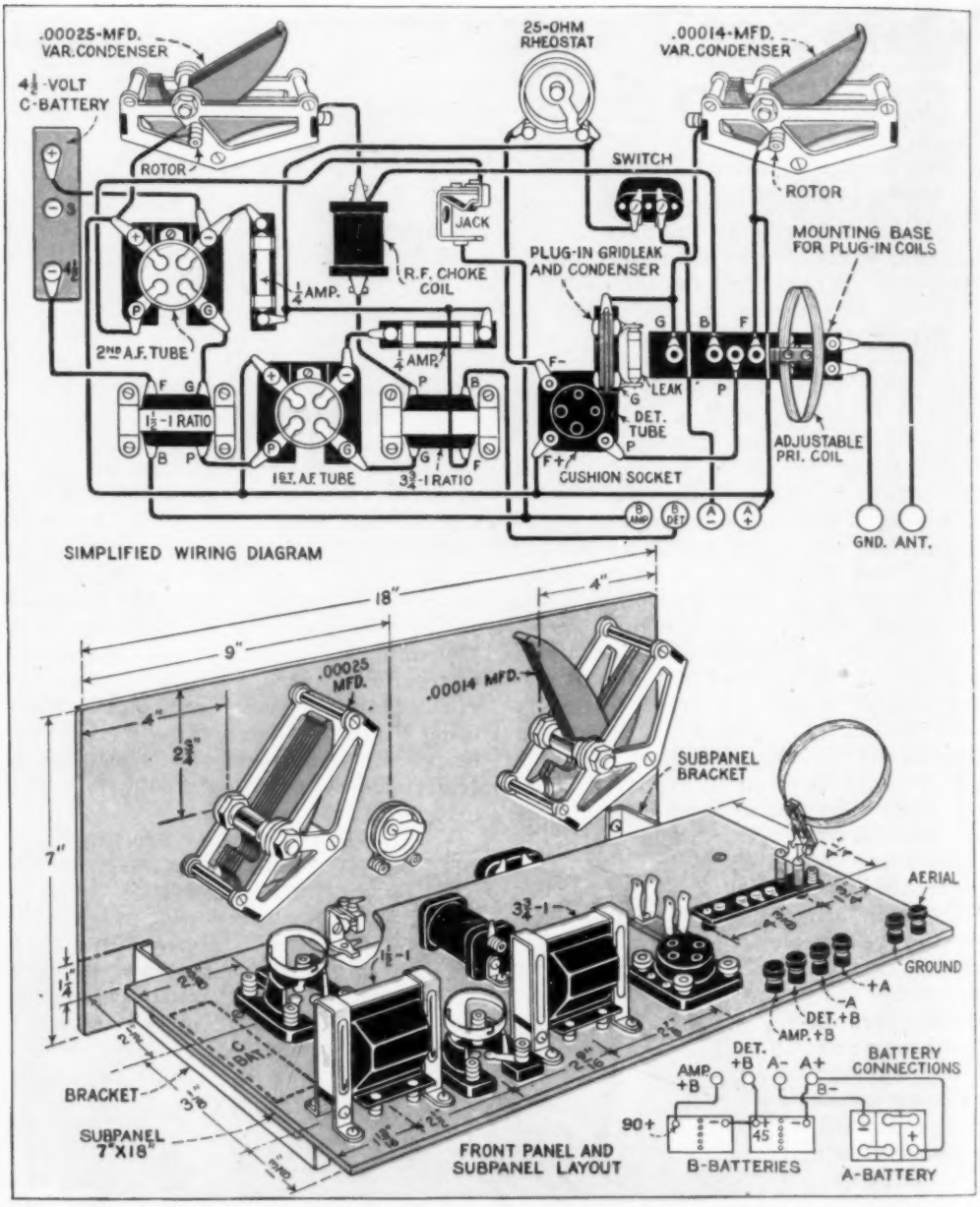
The three-tube set to be described is easy to build, and, as the front panel is only 7 in. wide and 18 in. long, takes up very little space. The front-panel and subpanel layouts are clearly shown in the illustration on the color page; it is important that the detector-tube socket be of the shock-absorber type for eliminating microphonic noises. The grid condenser and leak are mounted in spring clips so as to be readily removable, one end of this mounting being screwed to the detector-socket grid post. For the short waves, a .0001-mfd. grid condenser and a gridleak of from 6 to 9 meg. will give the best results. On the ordinary wave bands, when using either of the two larger coils, better results will be obtained with a .00025-mfd. grid condenser and a gridleak of from 2 to 6 meg. resistance.

In a set of this type every effort must be made to obtain short leads. To this end, the a.f. transformers used are constructed with removable bands or brackets; the latter being reversed and the transformers turned upside down so as to bring the terminals close to the subpanel.

The base for the plug-in coils is shown in its proper position, and the primary coil mounted

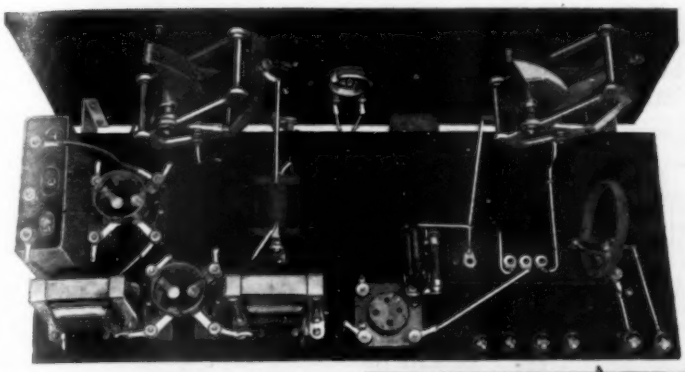
Completed Receiver, in Which Various Types of Interchangeable Coils Are Used

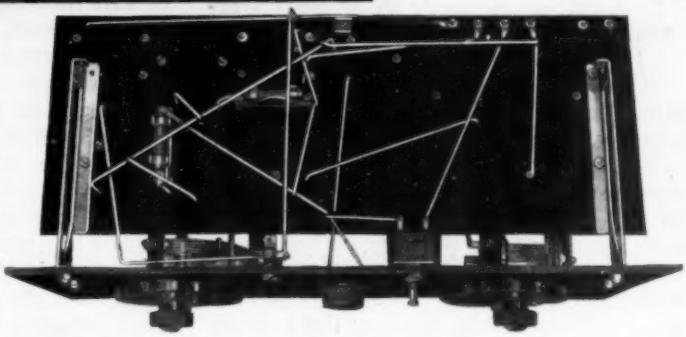
Copyright, 1926, Popular Mechanics Magazine



Above, Simplified Wiring Diagram, with All Instruments in Their Relative Positions; Below, Front-Panel and Subpanel Layouts with Battery Connections Shown at Lower Right

on this base may be adjusted for the best coupling with either a short or long aerial. This coil is permanent on the mounting; the plug-in coils are complete units, each consisting of a grid and plate inductance. The circuit used is of the "fixed tickler" capacity-controlled type, which is best suited for short-wave reception and also gives excellent results on the standard broadcast wavelengths when the proper coils are used. The wiring diagram is given above the instrument layout, and is extremely simple to follow. Soldering lugs should be used under all terminals. A schematic diagram is supplied for those who prefer it to the simplified form.





Looking Down on Subpanel; Right, Under-Subpanel View, Showing Ballasts and Method of Wiring

connect the batteries and place the tubes in the sockets. Three 201-A, or similar tubes, are used; plug in one of the larger short-wave coils and test out the set. Facing the receiver, the condenser at the left is the tuning control and the one at the right the feedback control. This feedback is not critical and the set will be found easy to tune. If the set howls, the capacity of the grid condenser must be raised and the value of the gridleak lowered.

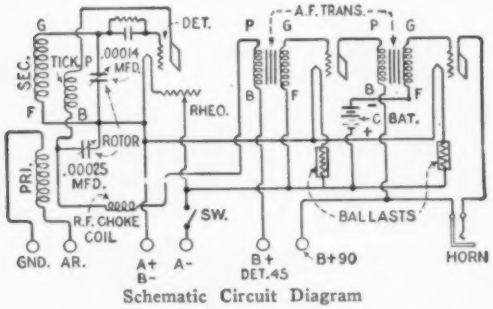
Before wiring the set, carefully examine the photos of the completed set; the upper one shows the method of running the wires through the subpanel, and the direction of these wires can be easily followed by referring to the under-subpanel view below. The rheostat controls the detector tube only, and ¼-amp. ballasts are used to control the filaments of both amplifier tubes. These ballasts are mounted on the underside of the subpanel by means of short brass machine screws. At the rear edge of the subpanel a strip of brass, 1/16 by ½ by 2½ in., bent to form a bracket, is mounted as a support for the subpanel at the center. If the set is to be mounted in a cabinet, see that there is clearance for the adjustable primary coil, so that, when placed in a horizontal position, it will not touch the side of the cabinet. Now, with the receiver wired and ready for operation,

When balancing the set, it is well to disconnect the aerial; then try various combinations of grid condensers and gridleaks, as tubes vary and short-wave sets are inclined to go into oscillation with a bang or howl, instead of the usual hiss. If the set is still "touchy" on the low waves, it may be necessary to change the detector, grid return, or bias, to negative instead of positive, as it now is. However, this is not likely to be necessary. When the best

MATERIAL LIST

1 front panel, 3-16 by 7 by 18 in.
1 subpanel, 3-16 by 7 by 18 in.
2 Benjamin subpanel brackets.
1 spring-suspended socket, X-type.
2 sockets, any good low-loss, X-type.
1 Jefferson a.f. transformer, type 41, 1½ to 1 ratio.
1 Jefferson a.f. transformer, type 41, 3.75 to 1 ratio.
1 Karas S.L.F. condenser, .00025 mfd.
1 Karas S.L.F. condenser, .00014 mfd.
1 Samson r.f. choke coil.
2 Daven ballasts, ¼ amp., or Amperites of same value.
1 open-circuit jack, short type.
1 25-ohm rheostat.
1 push-pull filament switch.
1 set Aero short-wave coils, 15 to 133 meters, complete with mounting base.
1 Aero coil No. 4, 125 to 250 meters.
1 Aero coil No. 5, 235 to 550 meters.
1 4½-volt C-battery, large type.
1 Sangamo fixed condenser, .0001 mfd.
1 Sangamo fixed condenser, .00025 mfd.
4 gridleaks, cartridge type, 2, 6, 7 and 9 meg.
1 combination grid condenser and leak mounting, removable-clip type.
6 binding posts with engraved tops.
4 2-ft. lengths of round, tinned-copper busbar wire.
3 doz. soldering lugs, long, round-hole type.
12 6-32 round-head brass machine screws, 1 in. long.
12 6-32 round-head brass machine screws, ½ in. long.
4 6-32 round-head brass machine screws, ½ in. long (nickelplated).

grid condenser and gridleak have been found, check the short-wave coils and make sure that the set can be made to oscillate smoothly from maximum to mini-



Schematic Circuit Diagram

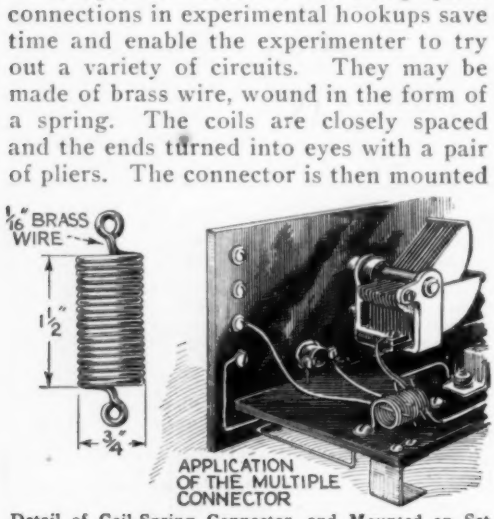
mum on the tuning condenser, without howling.

Either a long or short aeriai may be used for short-wave reception; one wire 50 ft. long gave excellent results. If the aerial is long, the primary coil must be loosely coupled or the set will not work uniformly on all wave bands. The coupling is loosened by moving the primary coil farther away.

A large wiring diagram may be had from Popular Mechanics Radio department, 200 E. Ontario street, Chicago, for 15 cents. Specify blueprint No. 115.

Handy Multiple Connector for Use in Experimental Circuits

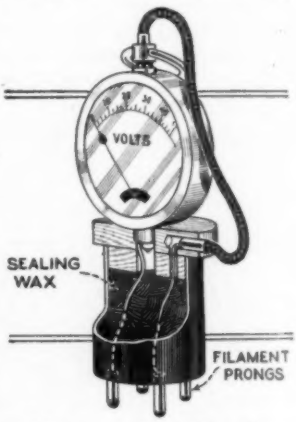
Multiple connectors for making quick connections in experimental hookups save time and enable the experimenter to try out a variety of circuits. They may be made of brass wire, wound in the form of a spring. The coils are closely spaced and the ends turned into eyes with a pair of pliers. The connector is then mounted on the baseboard at any convenient point by means of two small screws. The wires, terminals and connections are simply forced down between the coils, where they hold firmly. The best size for average use is made of 16-gauge brass wire, wound in a ¼-in. coil, about 1½ in. long.



Detail of Coil-Spring Connector, and Mounted on Set with Leads in Position

Socket Voltmeter Made from Discarded Tube Base

A useful socket voltmeter can be made from a small pocket voltmeter and a discarded tube base. The glass is removed from the base, leaving the wires from the filament prongs intact. Two small disks of wood are then turned down, one to fit snugly in the top of the socket, as shown, and the other slightly larger to form a cap, and the disks are glued together. Holes are then drilled in the disks, one just large enough to take the terminal on the case of the voltmeter, and the other, in the edge of the larger disk, to receive the cord terminal of the voltmeter. Small pieces of metal tubing, to which the tube-prong terminals have been soldered, are then forced into these holes. The inside of the tube base is filled with wax, which can be taken from the top of a discarded B-battery if desired. Before the wax has cooled, the wooden disks are forced down on top of and into the base. Forcing the voltmeter terminals into the metal-lined holes completes the instrument, and it may now be plugged into the sockets of the receiving set. The rheostat is then turned up until the voltmeter needle gives the proper reading for the tube that is to be used. Checking the tubes in this manner does away with all guesswork and greatly prolongs the life of the tube by removing the danger of excess filament voltage.—L. M. Curtis, Venice, California.



A Radio Cabinet of Striking Design

By EDWIN M. LOVE

THE unusual is achieved in the radio cabinet described here—beauty of design combined with strength and durability; yet so simple is the construction that the most inexperienced amateur can build it. While arranged especially for a 7 by 18-in. radio panel, a shorter one could be used by widening the battery boxes at the ends, or a longer, by extending the cabinet itself. The speaker shell is for a 12-in. cone speaker. (See Fig. 1.)

The front panels of the battery boxes, detailed in Fig. 2, are simple rectangles of 1-in. stock, carefully squared to 6 by 8 in. On the face side of each, cut a rabbet, 3/16 in. deep (or whatever thickness the panel is) and ¼ in. wide; and remembering that the two must be made as a pair, chisel out a notch in the upper end ½ by ½ by ¾ in., to carry the ends of the loose upper rail.

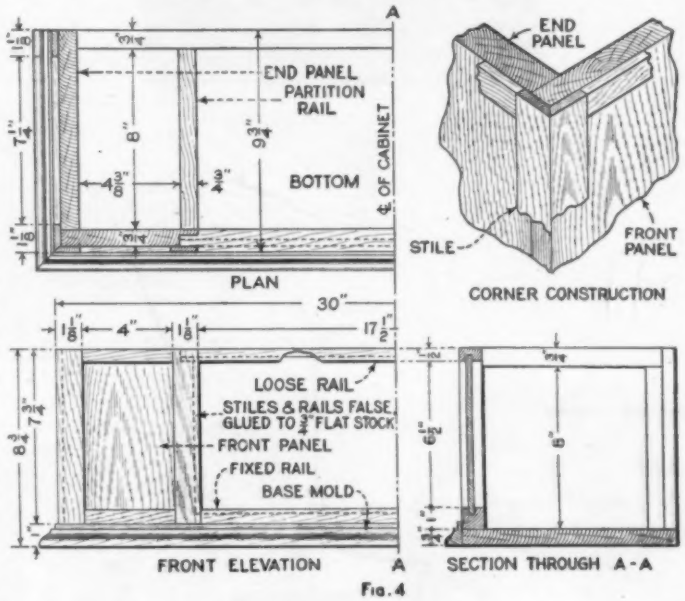


Fig. 4

The two end panels, shown in Fig. 3, are ¾ by 8¾ by 8 in. Make the back of pine, ¾ by 8 by 28 in., and the bottom, ¾ by 9¾ by 30 in.

Nail the ends to the back and the front panels to the ends, inclining the nails in various directions to increase their holding power, and the bottom to the lower edges, allowing it to project ¼ in. at the ends and front; or, if preferred, tack the parts together and insert ⅜-in. hardwood dowels in holes bored from the outside.

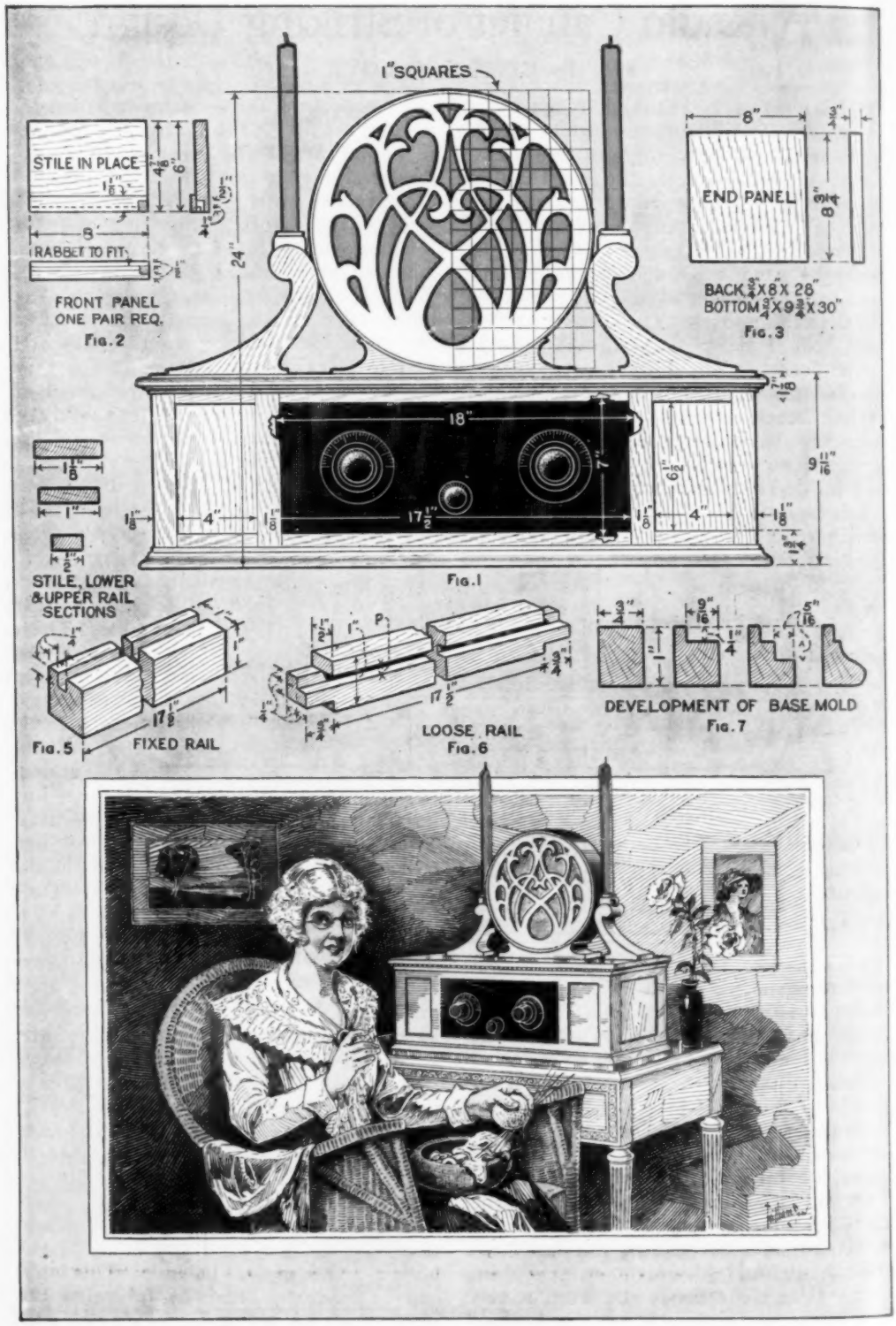
Now cut four ¾ by ¾-in. strips, 7¼ in. long. Glue these inside the front panels and back, perpendicular to the bottom and 4½ in. from the ends, inside measurements. Apply glue to both parts, for this is the only way to be sure that all the effective gluing surface is used. Across the tops of these cleats glue and nail spreaders of ¾ by ¾-in. stock.

Cut a piece of 1 by 1-in. net stock, 18 in. long, and plow a 3/16-in. groove, ¼ in. deep, ¼ in. from the front face, to receive the lower edge of the bakelite panel. Cut this to fit between the front panels, and glue in place on the bottom.

For the vertical panel strips or stiles, use stock ¼ in. by 1⅛ in. Flush with the panel edge of each front battery panel, glue on a stile; and glue flush with the back edges of the end-pieces their stiles. These need only be weighted in place until the glue is dry. Nails are unnecessary. For the corners, miter one edge of each to fit. Tack these in place by toe-nailing from the top ends and through the lower ends where the base mold will cover them. Allow one member to dry before gluing on its mate.

Now glue the upper and lower rails in place, using stock ½ in. wide for the upper and 1 in. for the lower. Cut these pieces long enough to require firm pressure to force them back, but not so tightly as to crush the edges of the stiles.

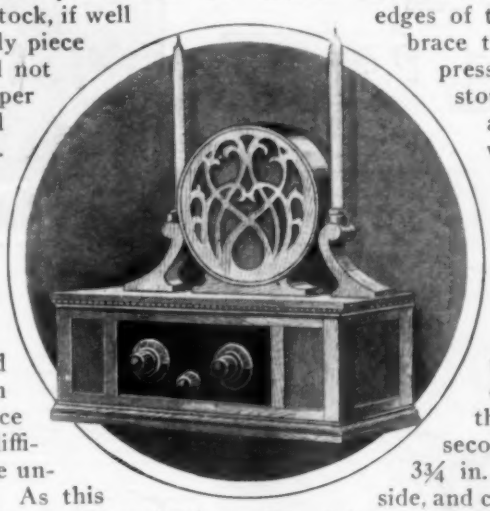
When all is dry, smooth the joints, and miter around the ends and front of the bottom a base mold, 1 in. wide. This mold can be made by hand, by following the steps indicated in Fig. 7, making two suc-


1"SQUARES
STILE IN PLACE
RABBET TO FIT
FRONT PANEL
ONE PAIR REQ.
Fig. 2
END PANEL
BACK $\frac{3}{4}$"X8"X 28"
BOTTOM $\frac{3}{4}$"X9$\frac{3}{4}$"X30"
Fig. 3
18"
24"
STILE, LOWER
& UPPER RAIL
SECTIONS
Fig. 1
FIXED RAIL
Fig. 5
LOOSE RAIL
Fig. 6
DEVELOPMENT OF BASE MOLD
Fig. 7

cessive rabbets and finally working out the curved part, or a suitable mold may be purchased at a picture-framing shop.

Make a loose rail, as in Fig. 7, 19 in. long, ½ by 1 in., with a 3/16 by ¼-in. groove ¼ in. from the face edge, and a ½ by ½-in. tenon centered on each end.

The lid is ¾ by 9¾ in. by 2 ft. 6 in. It can be made of solid stock, if well seasoned, but a five-ply piece is far better, as it will not warp. Only the upper side need be figured material (see Fig. 8). Make a ½ by ¾-in. nosing mold, which is mitered around the ends and front, dropping down from the top face 3/16 in. to show a margin. This may be tacked with 1-in. brads, driven through the cove, since otherwise it is quite difficult to keep it in place until the glue is dry. As this leaves a thin edge of the mold projecting below, the surface must be built up by gluing to the underside a 3/16 by 1-in. strip, running it all around. The back strip carries the hinges.



Make the speaker grill of ⅜-in. three-ply stock. Lay out a piece of tracing paper, 7 by 14 in., in 1-in. squares, and, following the intersections shown in Fig. 1, draw one-half the design. Notice that all lines of the stems are continuations of the rim circles and tangent to them. No two stems are the same width, and they vary in width throughout their length. The leaves spring from the stems on a tangent.

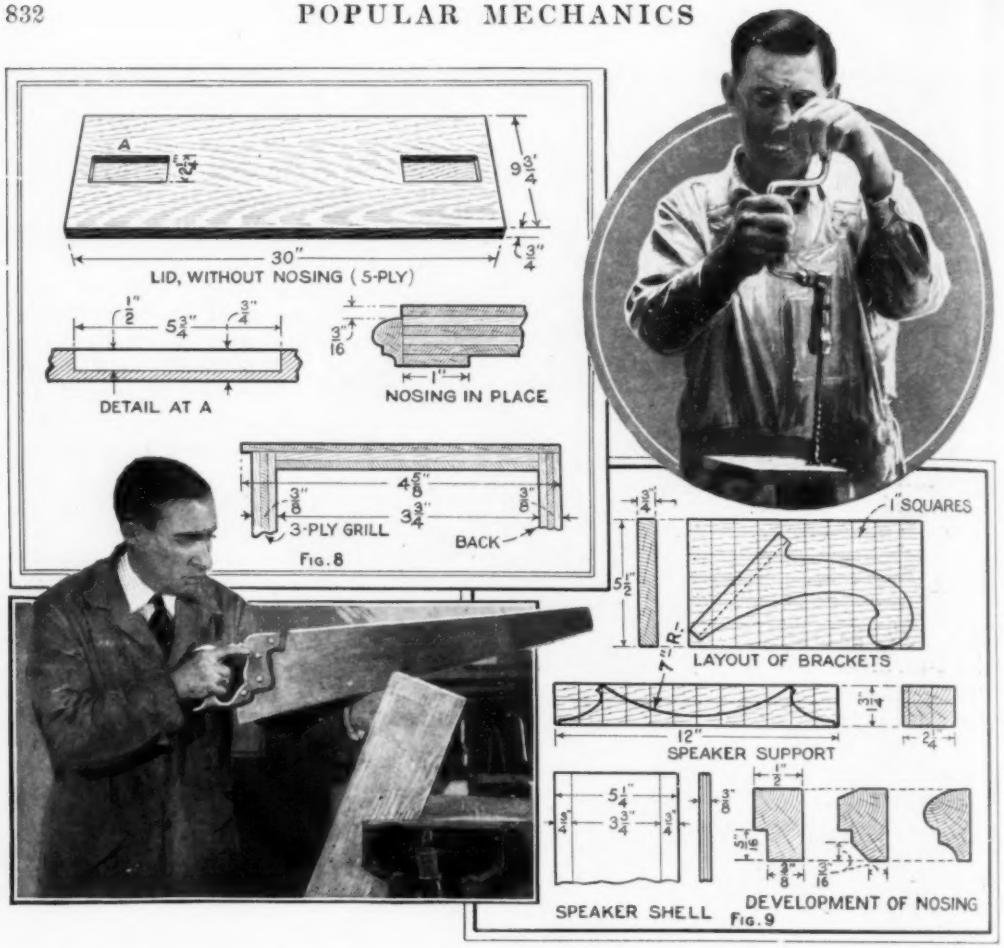
Draw a 14-in. circle on the stock, and divide with a vertical diameter. Trace the half design, turn the pattern over, and trace the other half. Bore holes through each part to be removed and use a bracket saw to cut them out. Smooth the edges with a fine file and sandpaper, being careful not to chip the corners.

Obtain three strips of ⅛-in. veneer, 45 in. long, one 5¼ in. wide, the others 3¾ in. If veneer is hard to get, gauge a piece of 1-in. stock, and ripping alternately from one edge and the other, cut a thickness. Smooth the stock, and repeat. Plane off high spots in the veneers thus produced. Make a back of three-ply stock, 14 in. in diameter, and cut out a disk 12½ in. in diameter.

Lay the finished grill, face downward, on ⅜-in. strips on the shop floor, or on some other surface where nails can be driven. Drive several nails against the edges of the cut-outs, so as to brace the grill for edgewise pressure. Have ready a stout cord, and bend around the grill the wide piece of veneer. It may be necessary to soak the stock in water before it will bend to the sharp curve. Cut off the surplus length and bind the cord around the veneer until it is drawn tightly against the grill edge. Bend a second piece of veneer, 3¾ in. wide, around the inside, and cut off the extra length. The joint need not be closer than 1/16 in. Bend a third piece of the same length and width inside of that.

Now take out the liners and coat the inside of the outer veneer with liquid glue. Coat one side of a liner, slip it into place, with the joint at the top, coat it inside, and coat the third piece, which in turn is put inside. They will not fit snugly together at this stage and the upper edge will be lopsided. Press the liners down against the grill, and slip in the back disk. Bind the veneer tightly against this, as well as the grill, which should bring it to a disk throughout. Then slip blocks, 3 in. wide, through the opening, press to the sides and wedge up with other blocks, until the veneers are well clamped together. Weight the assembly to eliminate possible twists, and allow to dry thoroughly.

After the glue has set, remove back, grill and clamping blocks. If there are any appreciable openings between the layers of veneer, mix thin glue with plaster of paris and run down into the spaces. Cover the back of the grill with tightly stretched silk, or fine-mesh bronze screen, using ¼-in. tacks to hold it on, and glue the grill into the shell. The back is held



on with small screws after the speaker is installed. Joint off the shell until the projection is ⅛ in., and round the corners.

Make the bracket pattern as shown in Fig. 9. If the brackets are to be sawed out by hand, use 1-in. stock, make six, and round off the corners of the curves to a radius of ⅛ in. Glue together in groups of threes. Smooth with a file and sandpaper. If they are cut with a bandsaw—any mill will cut them very cheaply—glue up the three thicknesses before cutting. The speaker support is made from stock 1¾ in. net by 2¼ in.

Lay out the upper surface of the lid for the bracket mortises, 2¼ by 5¾ in., 1 in. from the ends, and centered on the width. Stand the brackets on these spaces and trace around with a fine-pointed pencil. Then, with a sharp chisel, cut ⅛ in. inside, and hollow out to a depth of ½ in.; trim to the line, trying the brackets occasionally to see if they fit. Size the ends, and glue into the mortises.

Center the speaker support between the brackets, gluing and nailing it, and boring for the wires. Put the shell in position, and nail it to the support. A tack may also be driven into each bracket.

To furnish sockets for the candles, fit to the tops of the brackets pieces of 1½-in. round stock, bored with ¾-in. holes.

Remove all traces of glue, and sand well before staining. This design is suitable for either plain or two-tone finishing, or for gesso and polychrome work.

¶Squeals and howls caused by body capacity may be eliminated by shielding the back of the front panel with tin or copper foil. This foil must not short any instrument; ground the shield and the cores of the amplifying transformers to the negative terminal of the A-battery.

Correct C-Battery Voltage Important

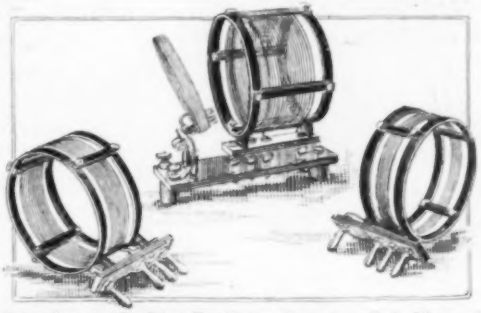
Correct C-battery voltage in the audio-amplifier circuit of any receiver is important. The battery should have the proper voltage in order that the amplifier tubes may receive the correct grid bias; an incorrect value will cause distortion. The C-battery voltage should be increased if the B-battery voltage is raised, as in the practice of adding a power tube in the last stage. Assuming that the normal total B-battery voltage was 90 before the power tube was added, and a 4½-volt C-battery was used, the power tube should have a plate voltage of 135 and at this voltage a 9-volt C-battery must be used. The proper C-voltage for the tube is specified by the manufacturer and should be followed carefully for best results.

Model House Wired for Radio

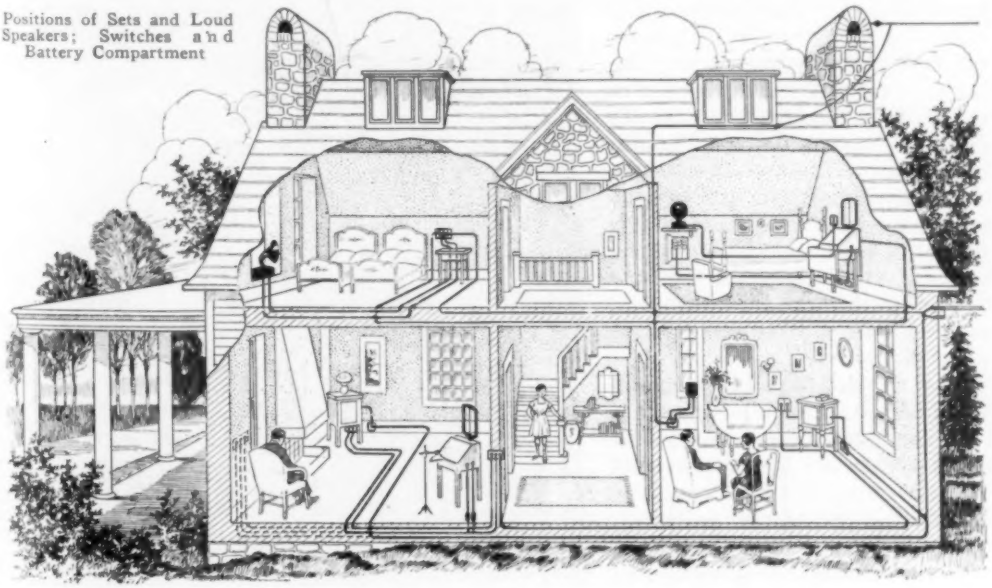
This model home, correctly wired for radio, was recently designed by one of the large radio manufacturers. The positions of the various sets and loud speakers as well as the method of wiring are clearly shown in the illustration. Note the outlets in the baseboards, and the remote-control switches and battery compartment on the second floor. The loud speaker, in the living room, may be plugged into the porch circuit if desired. The aerial, from the point where it enters the building, is inclosed in conduit in the walls. Many new homes and apartment buildings are now being wired for radio, and this model home was designed for the purpose of properly guiding the builder.

Plug-In Coils for Short Waves

Plug-in coils are now available for short-wave receivers. The set shown in the illustration consists of three interchangeable coils and a mounting on which is placed an adjustable primary coil. The coupling of the primary coil may be set for best results with either a long or short aerial. The interchangeable coils each have a grid and plate inductance and cover a range from 15 to 130 meters. Coils to 550 meters may be obtained if desired.



Interchangeable Plug-In Coils, Showing Coil Plugged into Mounting at Rear



Positions of Sets and Loud Speakers; Switches and Battery Compartment

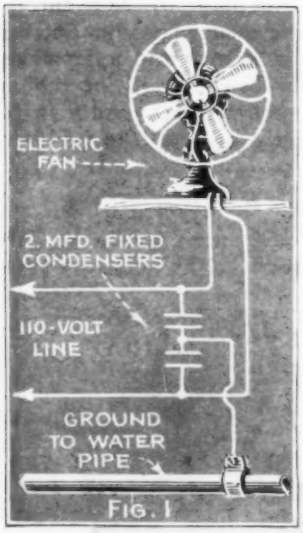


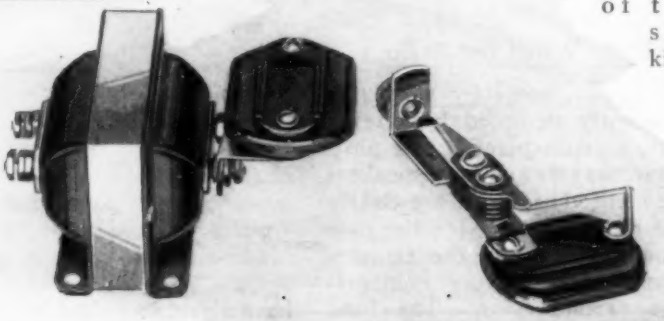
FIG. 1

Fixed-Condenser Kinks

By WM. CALVERT

THE fixed condenser is a necessary adjunct to most receiving circuits, but the part it plays is not always clearly understood by the average builder. They are often used at random by the experimenter, many times with surprising results. When properly used, fixed condensers are a specific remedy for many inefficient sets and may also be used to eliminate troublesome interference.

While pointing out the various purposes for which they may be used, it may be of interest to take one apart and see how it is made. Available in all sorts of shapes and capacities, the construction is practically the same in all types; alternating sheets of tin or copper foil and mica, make up the unit, the capacity depending on the size and number of the metallic sheets, the kind of insulating material and the method of construction. The capacity is carefully measured by the manufacturer and stamped on the unit; if carefully made and protected from moisture this capacity does not vary. The small types shown in the illustration are specially designed for radio use; larger types capable of withstanding high voltages may be used for eliminating interference from electrically operated devices, such as electric fans, motors and battery chargers.



The method is clearly shown in the illustration, Fig. 1; two 2-mfd. condensers are connected in series across the power line near the apparatus that is causing the trouble. The center point, or common connection between the two condensers, is then grounded

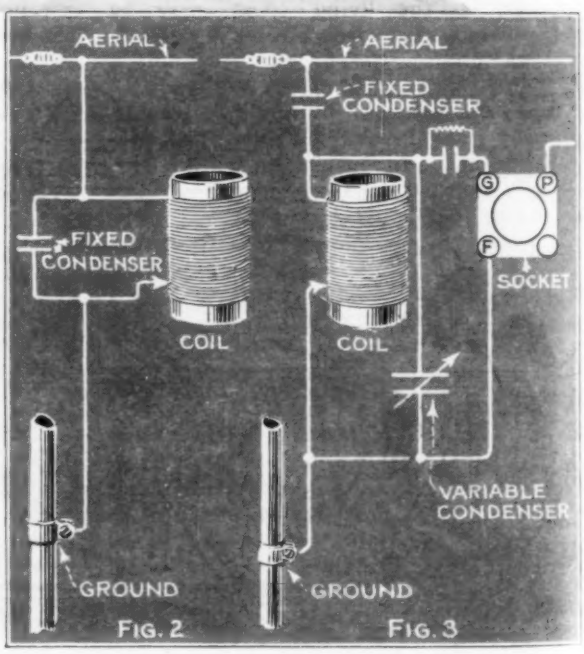


FIG. 2 FIG. 3

to a water pipe, as shown in the diagram. When connecting fixed condensers of the small type in radio sets, never apply the iron directly to the condenser; use soldering lugs and fasten them to the condenser by means of short brass machine screws. If the condenser is to be fastened to some piece of apparatus, such as a transformer, it is advisable to use short metal strips drilled to take the binding posts and machine screws, as shown in the photo. A .0005-mfd. condenser placed across the secondary of the last a.f. transformer will often eliminate the high-pitched whistle in the loud speaker caused by the a.f. amplifier. In some cases it is advisable to place the condenser across the primary of the transformer; try both positions for best results. Shunting the loud-speaker jack with a condenser, as shown at right, will often give better results in tone, permitting the speaker

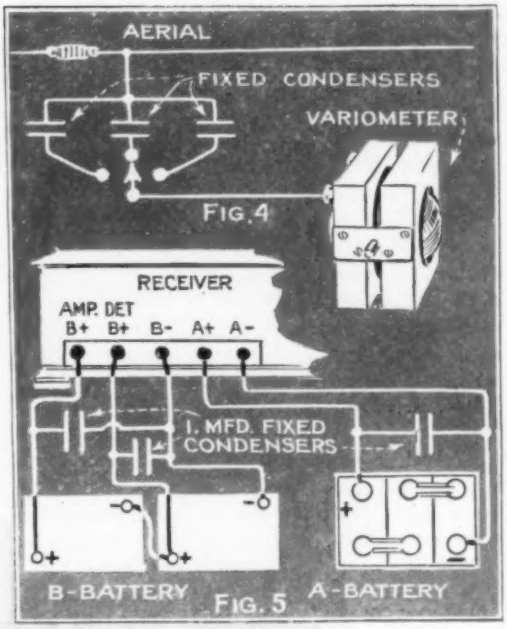
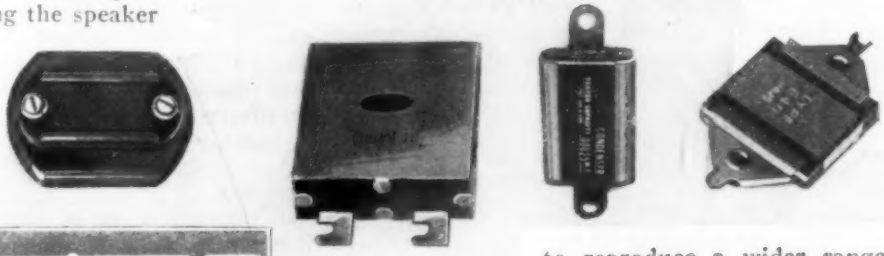


FIG. 4

FIG. 5



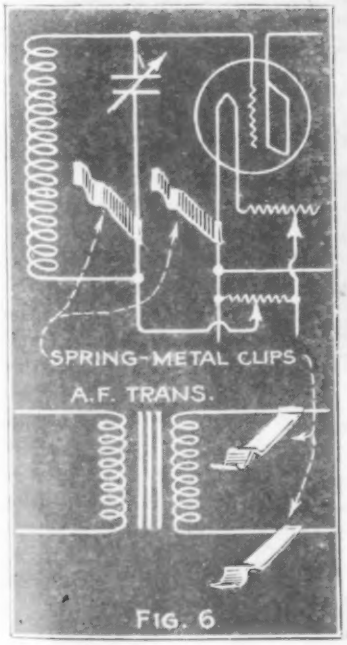
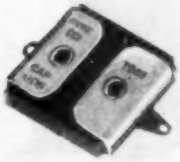


FIG. 6



to reproduce a wider range of frequencies; this condenser may be .001 to .006 mfd.

The experimenter often wishes to reduce or increase the capacity of variable condensers, or change the inductance value of coils; this is easily done with fixed condensers. By shunting a fixed condenser across the inductance, as shown in Fig. 2, the wavelength of the circuit will be raised; if this condenser is variable the wavelength may, of course, be varied at will. However, in most cases, with simple sets, it is only necessary to raise the wavelength to a certain point and a fixed condenser of suitable capacity may be used as shown.

For reducing the inductance value of a circuit for shorter wavelengths, a fixed condenser

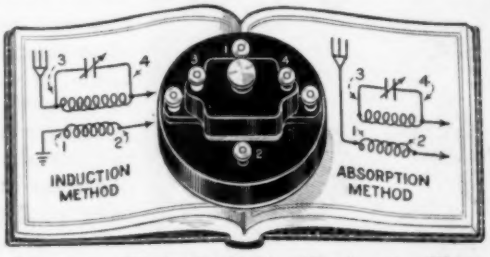
may be used in series with the coil and antenna, as shown in Fig. 3, and even more flexibility may be obtained by employing several capacities, as shown in Fig. 4, a switch being used to change from one capacity to the other. In tuned circuits of this type such a method is advised to easily adapt the set to aerials of various lengths. It is common practice now to place the various batteries at a distance from the set in order that they may be out of sight. They are often placed in the basement or in a near-by closet; long leads are necessary in either case and the result is a loss of selectivity as well as noisy operation due to the pick-up of the leads. This may be remedied by the use of fixed condensers for by-passing the various batteries; these by-pass condensers should be placed across the leads at the set and not at the batteries, or the effect will be lost. By-pass condensers of either .5 or 1 mfd. may be used for this purpose. Fixed condensers are not expensive; they are one item used in the construction of a radio set that has dropped lower in price than any other. In the early days precision condensers cost as high as $25; now even better units may be obtained for from 40 to 75 cents.

The capacities required for most circuits are always specified, although the experimenter often finds that a greater or less capacity than that specified is needed. The change of capacity required, may be due to the experimenter's location, the use of parts other than those called for, or the placing of parts on the baseboard. In cases of this kind, it is usually necessary to try a number of condensers before the correct capacity is found. To facilitate this testing operation, a pair of small clips, made of light spring metal, may be bent in the form shown in Fig. 6 and soldered to the busbar wires, thus doing away with the necessity of soldering and unsoldering each condenser tried.

All fixed condensers are not adaptable to this method, but for those that may be clipped in and out of the circuit, these little clips are very useful. If the condenser is constructed so that it cannot be used in this manner, short lengths of busbar wire may be soldered to the circuit leads instead of the clips; lugs are then soldered to the ends of the short wires so that the condenser may be screwed in position with short brass machine screws. It is a simple operation to remove the screws and put in a condenser of different capacity.

Device Designed to Reduce Interference and Static

A small instrument designed to assist in tuning the set so as to eliminate interference and reduce static has appeared on the market. It is especially recommended for warm-weather reception when static interference is most prevalent. It is composed of a tuning coil which is balanced by a small variable condenser, providing an additional means of tuning for any tube or crystal set, excepting sets which are operated on a loop. The numbered terminals on the instrument are for the various connections given in the diagrams. One way of using the unit is by induction and the other by absorption; the latter method is advised for the reduction of static, although it slightly reduces the volume. The induction method will assist and improve the volume, it is claimed.

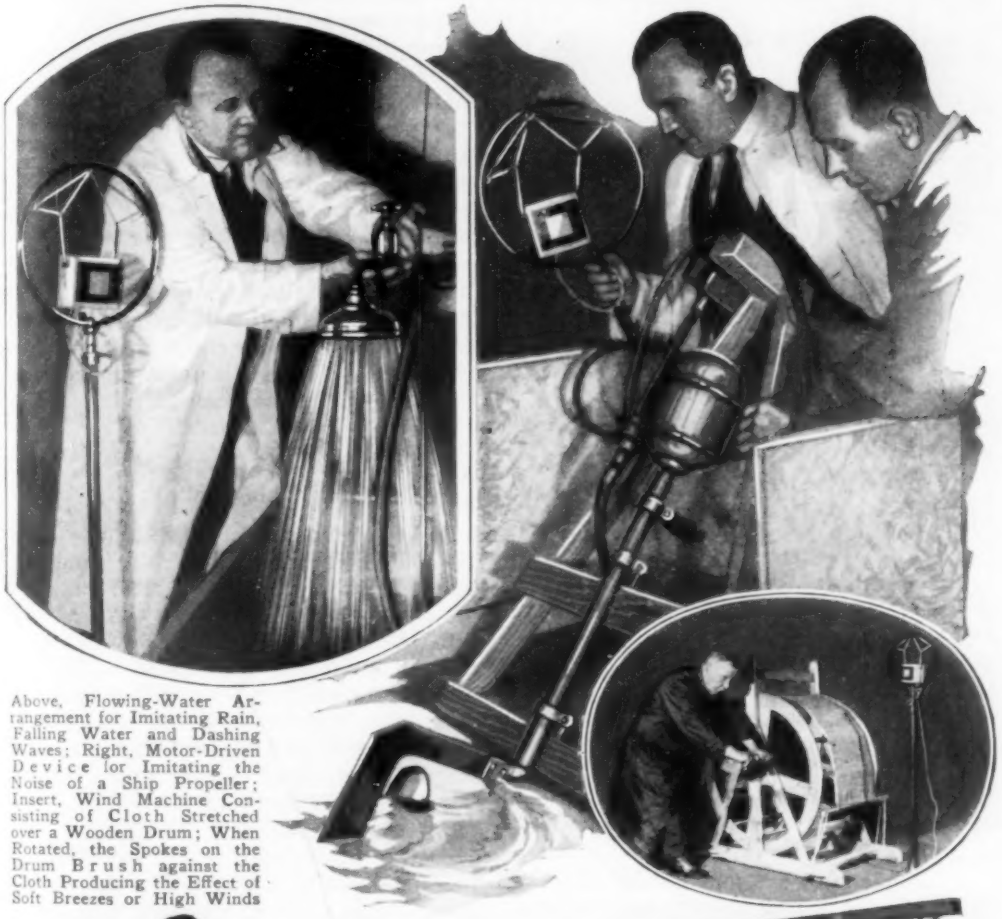


Interference-Eliminating Device, Showing Two Ways in Which It May Be Used

Testing Dry-Cell Batteries

Dry cells vary in amperage according to the make, but the usual cell should register from 30 to 35 amp. when fresh. An ammeter should be used for testing dry-cell A-batteries, and is to be left in the circuit just long enough to obtain the reading. Care should be taken that the meter is connected properly. If connected backward, the pointer will be deflected off the scale in the wrong direction. If the reading is below 10 amp., the cell is worn out.

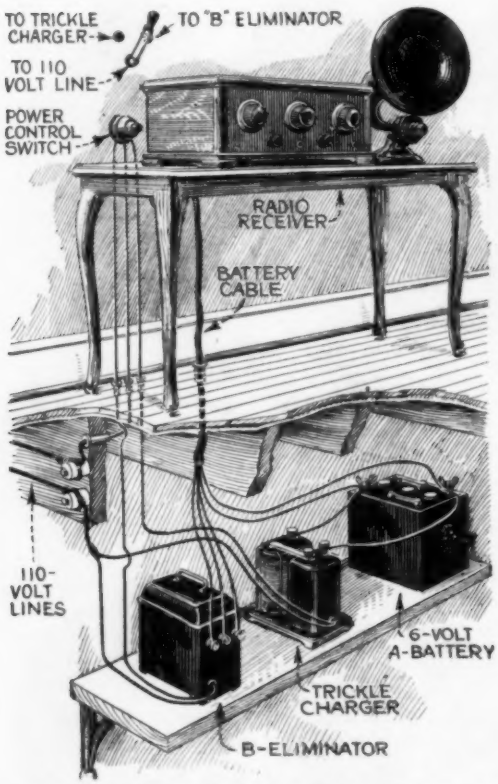
MAKING THE GERMAN RADIO PLAY REALISTIC



Above, Flowing-Water Arrangement for Imitating Rain, Falling Water and Dashing Waves; Right, Motor-Driven Device for Imitating the Noise of a Ship Propeller; Insert, Wind Machine Consisting of Cloth Stretched over a Wooden Drum; When Rotated, the Spokes on the Drum Brush against the Cloth Producing the Effect of Soft Breezes or High Winds

Left, Oxygen Cylinder Used for Producing the Illusion of Steam Discharged from a Locomotive; Center, Table with a Number of Devices for Various Noises Such as Table Bells, Telephone Alarms, Ventilators and Signal Horns; Right, Special Apparatus for Producing a Number of Animal Sounds, and Bells

Simple Power-Control Switch

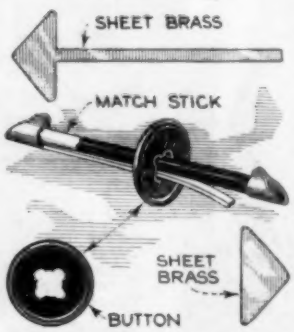


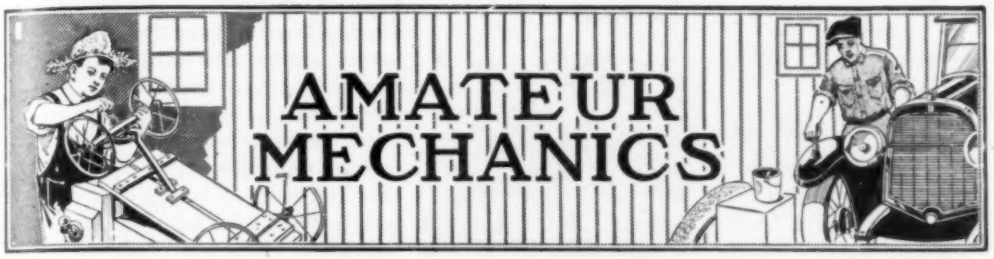
Simple Power-Control Switch for Trickle Charger and B-Eliminator with Connections

A simple power control for trickle chargers and B-eliminators may be obtained by means of a switch mounted on the wall, or at some other convenient place near the set. Power-control devices are now on the market, but for those who prefer to make their own, this simple switching device will give good service. The equipment consists of a three-point switch, of either the snap or push-button type, and the illustration shows the connections clearly. The switch lever and contact points merely illustrate the action of this snap switch and are not a part of the hookup. If the house has a cellar, it is always desirable to place the batteries, charger and eliminator there. When tapping the 110-volt line, one side is connected directly to the trickle charger, and to the B-eliminator; the other side of the line goes to the post on the bridged contacts of the control switch. The remaining two posts on the switch are connected, one to the other input wire on trickle charger, and the second to the wire on the B-eliminator. With a snap-switch the eliminator and charger will alternate on or off with each snap of the switch. If the flush push-button type of switch is used, pressing one button will shut off the charger and connect the eliminator, in which position the set can be operated. Pressing the other button will shut off the eliminator and connect the charger. It will be seen that the filaments of the tubes must be operated independently by the filament switch on the set, or by turning the rheostats to the off position, if the set is not equipped with a switch.—E. J. Bachmann, Fullerton, Pa.

Button and Match Make Variable Gridleak

The radio fan can always find use for a variable high resistance; and nothing could be simpler to make than the unit shown in the drawing. It can be used either as a gridleak or for the resistance-coupled amplifier. It is also handy for stopping howls in a.f. amplifiers, and for controlling volume. The construction is shown in the illustration, and the cost is practically nothing, as the unit is made from a match, a button, a bit of brass sheet and a little India ink. The head is cut from the match, leaving the stem 1¾ in. long; starting from the end of the match, about 1¼ in. is heavily coated with India ink and allowed to dry. The sheet brass should not be too thick and should have a bit of spring to it; the manner of cutting and shaping it is clearly shown. The button is ½ in. in diameter and a hole is cut or drilled in it as shown. When the unit is completed, sliding the button up or down changes the amount of brass in contact with the inked surface and thus varies the resistance. The unit is remarkably quiet and has proved satisfactory in use.—Watson Brown, Iuka, Miss.





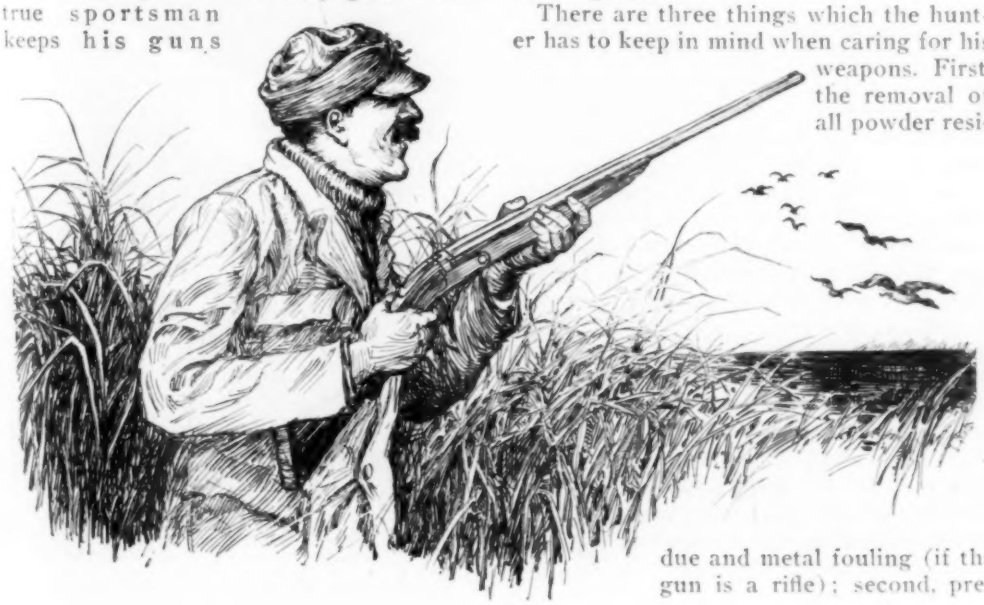
How to Take Care of Your Guns

By BOB BECKER

OF all the items in a hunter's outfit nothing requires so much attention as his gun or guns. Rubber boots can be taken off and tossed in a corner. Wet clothing can be hung up to dry without fear of rust or damage. Shells will keep from year's end to another without attention, but once a gun has been used afield the hunter's day is not ended until the weapon has been cleaned thoroughly and properly.

Without question, more shotguns and rifles are partly or completely ruined by lack of attention or unintelligent cleaning than by using the weapons too much. And, in the long run, that precious ingredient known as "elbow grease" is the thing that keeps one's gun rack looking well. A lazy man has dirty guns. The true sportsman keeps his guns clean and shining and thereby lengthens their life. After using rifles, pistols and shotguns on a variety of game from Alaska on the north to the swampy tropics of the Amazon and Bolivia on the south (where improper or careless cleaning methods quickly and completely ruin a gun), I recommend the following procedure if one wishes to keep his armory full of shining, straight-shooting, unfouled weapons: Never leave your gun dirty overnight, especially if it is both wet and dirty; use patent cleaners equipped with brass-wire gauze if the barrels are very dirty; use a nitro solvent to remove residue in the barrel; don't spare the oil when cleaning any gun or preparing the weapon for storage, and use plenty of elbow grease.

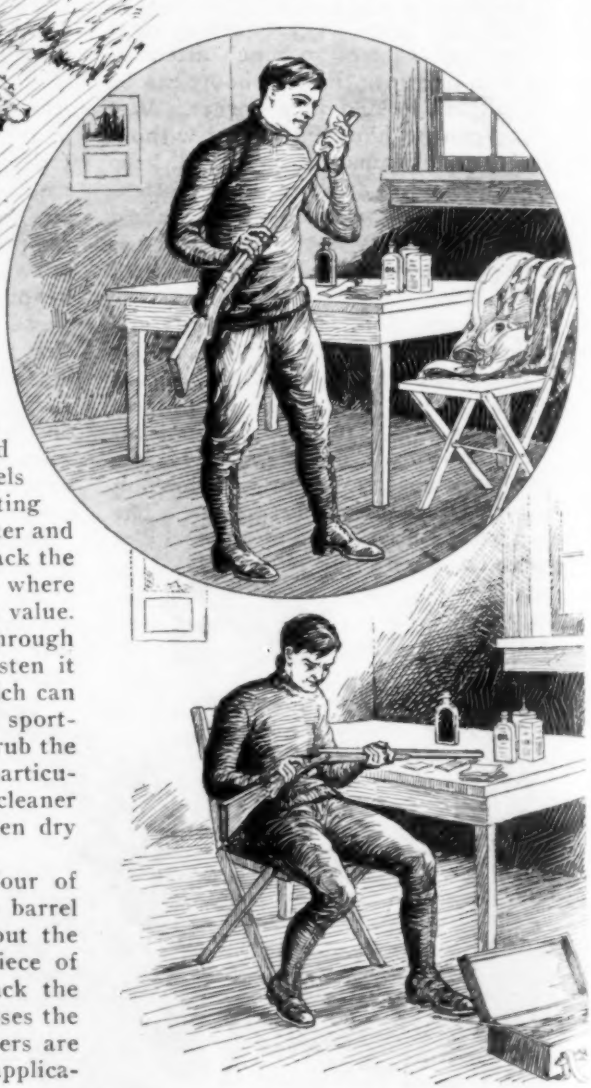
There are three things which the hunter has to keep in mind when caring for his weapons. First, the removal of all powder residue and metal fouling (if the gun is a rifle); second, pre-



vention of rust, and third, proper oiling. The first is the most difficult feat and the one in which most gun owners fail.

To clean a shotgun proceed as follows: Take the gun apart and give attention to the barrel or barrels first of all. If you have been shooting in the rain, wipe off most of the water and then assemble a cleaning rod to attack the residue in the chambers. Here is where a bottle of nitro solvent is of great value. Run a small piece of woolen cloth through the slot in the cleaning rod, moisten it thoroughly with nitro solvent (which can be purchased in practically every sporting-goods store) and vigorously scrub the inside of the barrel. If the gun is particularly dirty, use a brass wire-gauze cleaner after an application of solvent, then dry flannel patches.

After you have run three or four of these flannel patches through the barrel they appear to come out clean, but the wise man will moisten another piece of cloth with nitro solvent and attack the bore again. The result often suprises the gun owner who thinks the chambers are free from fouling, as this second application of solvent will often reveal a black stain upon the flannel patches which means that even though the barrels appear bright and shiny, there remains upon the steel an almost invisible wash or plating left by the smokeless powder. All of this must be removed before the gun is oiled and set aside as a finished job. After this solvent treatment, the gun owner should follow with dry pieces of flannel until the last one comes out clean. Then moisten one with a thin gun oil



and scrub the bore in order to leave a coating of protective oil on the steel. If the gun is to be set aside for some time, it is best to finish with a heavy grease. Just to play safe and to make sure that I have removed every speck of fouling from the guns I have used, I always go back to them one or two days after cleaning and check up by running flannel patches through the barrels.

In the care of rifles, even more attention must be given the cleaning and oiling job than in treating shotguns. This applies to small-bore guns, such as the .22-caliber, and to the high-power big-game guns, where metal fouling is a factor to be dealt with. In cleaning and caring for a .22 rifle, the most popular small gun in the United States, nitro solvent (No. 9) should be used freely. Use a small woolen rag in a slotted wiper soaked in solvent, or if the fouling has become caked in the bore, pour a small amount of the liquid through the barrel before introducing the cleaning patch. Start the rag from the breech of the gun and not from the muzzle. Another point to keep in mind is that the cleaning patch should be allowed to follow the rifling of the barrel. If you force a swab time after time across the rifling you may ruin it. This means the shooting qualities of your gun are gone, as perfect rifling is essential to accuracy. Likewise, even a slight burr on the muzzle of the arm will impair its accuracy. Hence the rule to clean the bore from the breech and not from the muzzle, where one is likely to inflict a careless knock with the cleaning rod. In cleaning a .22 rifle which, contrary to popular belief, is one of the most difficult bores to keep clean and in perfect condition due to the action of smokeless pow-

der, the gun owner should swab the bore with as many small wool patches as are needed to finish with an unstained piece. The rule is: Use elbow grease until they show white.

Corrosion and not erosion is the menace of high-powered guns and hundreds of finely made guns go into the scrap heap every year because the shooter-owner does not understand how to combat the corrosion evil, which, in simple language, means that by failure to thoroughly remove the metal and powder fouling in a barrel it is attacked by these steel destroyers and completely ruined.

Ammonia is one of the powerful allies of the rifle owner, if he will only use this common cleaning fluid. Ammonia naturally comes into this cleaning operation because the fouling in the bore of a high-power rifle is usually acid due to the combination of powder and primer explosion. This fouling is very tenacious. No mere scrubbing with woolen rags removes it, nor will the common thin gun oils touch it as a rule. To remove this residue from the bore of a high-power rifle, where there are no lumpy bits of metal fouling, strong ammonia, containing not less than 28 per cent ammonia gas, is required. Thoroughly scrub the bore with several pieces of wool cloth soaked in this fluid and then run two or three through the barrel to dry it. Follow this treatment with two oily patches, and the bore should be in good shape However, the next day better repeat this treatment so as to be sure that the barrel is absolutely clean.

The hunter who goes afield to shoot smokeless-powder shells with lead-alloy bullets encounters another difficulty when it comes time to clean his weapon. He must not only remove the fouling which comes from the powder but the lead deposits which have been laid down in the bore by the bullets. This condition is called "leading." Sometimes you will see it in the form of tiny lumps or scales, and sometimes you won't see it at all, as it takes

the form of a well-nigh invisible plating. To remedy this condition, first clean the bore with ammonia by scrubbing it thoroughly with pieces of flannel rag soaked in it. Then dry it by running several more patches through the barrel. Next smear several cleaning patches with mercurial ointment and scrub the bore with them, finally running a rag heavily coated with ointment through the barrel so that the bore will be thickly greased when you put it away. After 24 hours this procedure should be repeated.

If a rifle barrel has been neglected for some time and rust has taken hold, there is a chance that the bore may be restored by the use of a metal anti-fouling solution and a rust remover. Place the gun in a vertical position, pour through it 1 qt. or more of boiling-hot soap suds. Then scrub it vigorously with a flannel patch moistened with soapy water. Run two or three dry rags through the bore, and you are ready for the next step.

A rubber cork, which fits the chamber of your rifle snugly, is necessary for this operation. Cork the chamber and then fill it with a metal anti-fouling solution, which your druggist can mix for you. It must be freshly made and kept tightly corked until you feed it to the rusty rifle. The solution is made up as follows: Ammonia containing 28 per cent gas, 3 oz.; water, 2 oz.; ammonium persulphate, ½ oz., and ammonia carbonate, 100 gr.

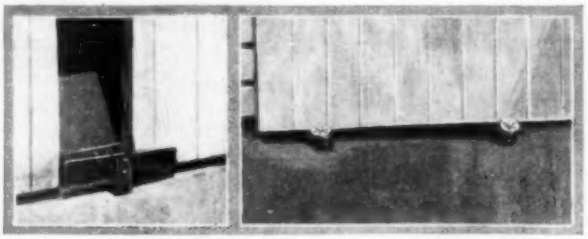
This is rather a ticklish solution as it will "eat" your stock if any of it is spilled on the wood. So, watch your step when you are pouring it into the bore. Also, it rusts steel if allowed to evaporate on it. The solution should be left in the bore not more than 30 minutes. Then attack the bore with cleaning patches until it is dry and finally use a new stiff brass-bristle brush to loosen up the fouling that remains. This treatment is then repeated.

Next comes the use of a rust remover, which can be purchased at a sporting-goods store. Several patches of flannel covered with this dope should be run through the barrel. Use plenty of elbow grease on this operation and then clean the bore with dry patches, oil it up and you are ready to see if the old shooting iron is going to shoot straight or bend bullets around trees. If its shooting qualities are not evident after this operation, better chuck the barrel into the scrap heap and get a new one.

Just one more part of the rifle or shotgun which needs a little attention if you have pride in your gun cabinet. This is the stock. Don't smear it with gun oil if you wish to preserve the luster of its finish. Raw linseed oil, a flannel rag and a minute or two of vigorous rubbing is the successful combination for gunstocks. But for every minute put in on the stock, hours must be expended on the bore and other steel in a gun.

Keeping Garage Doors Snug

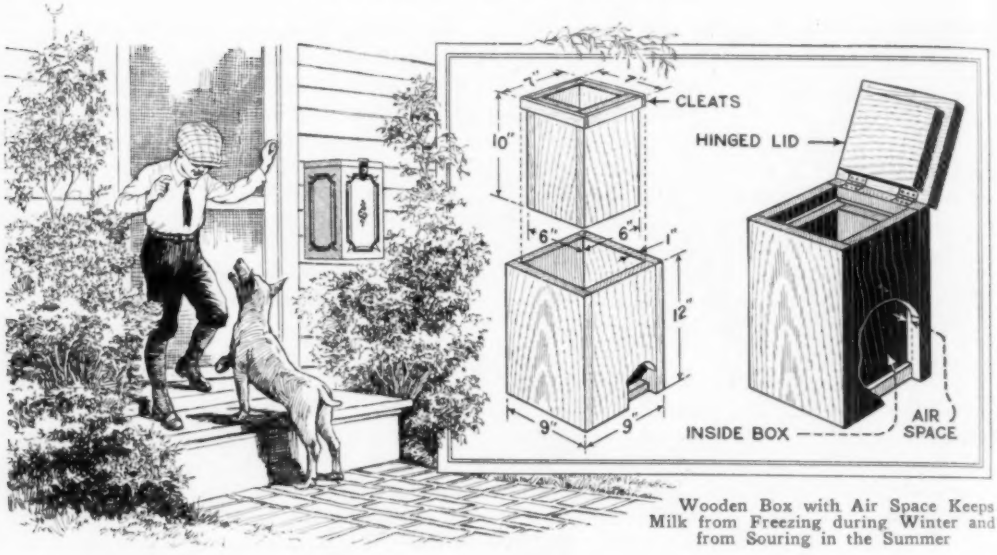
To prevent the sliding garage doors from swinging in the wind, equip them with the features shown in the photo. Two small iron rollers are set near the end, just far enough away to permit the door to move easily back and forth. At the center two broad iron straps are riveted to short iron rods set in the cement. Note that each end of the straps is curved out slightly. This squeeze fastener does not interfere with driving the car in and out and effectively prevents the doors from swinging.



Fasteners on Sliding Garage Door Prevent It from Swinging in the Wind

A Register Screen

To prevent pencils, buttons, coins, and the like from falling into the hot-air registers, I cut pieces of ordinary screen-door netting, and fitted them into the openings. They will not interfere with circulation.—F. J. Pease, Wauwatosa, Wis.



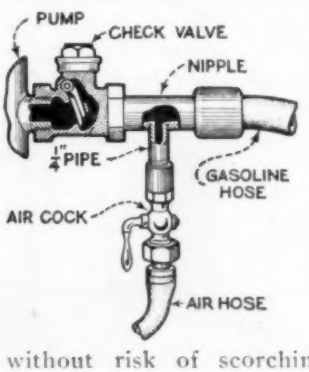
Wooden Box with Air Space Keeps Milk from Freezing during Winter and from Souring in the Summer

Insulated Box for the Milk Bottle

For years we have had considerable trouble during the winter in preventing our milk from freezing on the porch, and keeping it from souring during the summer, before the bottle was taken into the house. To eliminate this trouble, I made a box out of 1-in. lumber, 9 by 9 in. in outside measurements, and 12 in. deep with the top open. For the inside I made a box without top or bottom, 6 by 6 in. and 10 in. deep, with a rim around the top of sufficient thickness to fill up the space between the two boxes after the smaller one was set firmly into the large one. This left a dead-air space between the two boxes. For the top, I took a 1-in. board, 9 by 9 in. in size, with a 1 in. board tacked underneath it to allow it to slide inside of the larger box at the top. This formed the lid, which permitted it to be opened or shut easily. During the winter, when the weather was 10° above zero, although left out in the open all day, the milk did not freeze, and this summer it has kept nicely with the temperature at 50 and 60°.—W. H. Snyder, Pocatello, Idaho.

Compressed Air Forces Gas from Hose

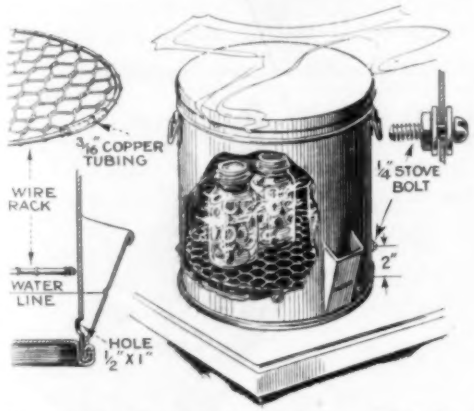
Gasoline stations owning their pumps can overcome the present method of draining the hose into the auto tank by the use of compressed air. The air is used directly from the tire-filling apparatus and will force out the last drop of gas from the hose. Disconnect the hose and fit a one-way gate check valve to the connection at the pump, so that no gasoline can be forced back into the pump. Then add a short nipple ahead of this check, drill and tap a ¼-in. hole in the pipe from the air hose. The gasoline hose can be attached to the end of the large nipple in the regular manner, either by threading on the coupling or by a hose clamp and bolts. A spring shut-off cock should be inserted in the air line at a convenient point at the pump. In use, the gasoline is fed into the automobile tank in the usual manner, but instead of lifting the hose to allow it to drain, the air cock is depressed. This allows the air to flow into the hose and force out the residue, but the check in the gas line prevents the air from forcing the gas into the pump and back into the supply tank. As soon as the gas is out of the hose, the cock is closed.—L. B. Robbins, Harwich, Mass.



¶To boil milk without risk of scorching it, the pan should be well rinsed in cold water before putting in the milk.

A Lard-Can Steam Cooker

A low-pressure steam cooker can be made at home out of a 45-lb. tin lard can. Those made out of black iron cannot be used. Select one in good shape, with a tight-fitting lid. Take a clean tomato can about No. 2 or 3 size to make the water filler and gauge. This is easily shaped and soldered to the lard can as shown. If you wish to use two packs, you need eight 3/16 or 1/4-in. stove bolts, 1 in. long, and sixteen washers. The first row of bolts is evenly spaced around the can, 2 in. from the bottom, measuring on the outside of the can. Put them in as shown in the detail and solder the washers and bolt heads to the can. Make one or two jar racks, as shown, using No. 9 wire for the rim, and 3/16-in. copper tubing to make a neat joint. Solder the ends together. Use square-mesh galvanized cloth or netting, twisting the wires onto the rim so that there will be no sag. The wire hoops for the rack should be about 1 in. smaller than the inside of the lard can. If you wish to use pints when canning, make two racks. The water line should be about 1/4



Low-Pressure Steam Cooker Made from Forty-Five-Pound Lard Can

to 1/2 in. below the bottom of the jars. If the bottom of the lard can should leak, solder it all around the inside of the seam. Cut a 1/2 by 1-in. hole about 1/4 in. from the bottom before soldering on the water gauge.—Geo. H. Cappel, Wilmer, Ala.

¶Always mix starch with soap water; this will prevent the iron from sticking and will give the linen a higher gloss.

Lightweight Trombone Mute Found Effective

Lightweight Mute for Trombone

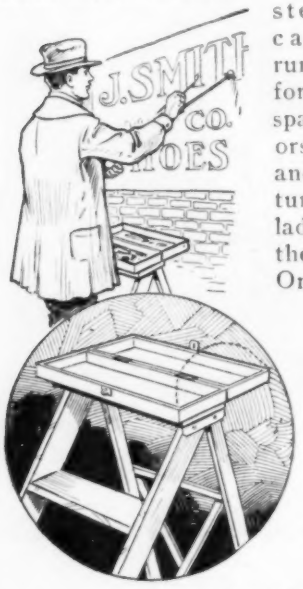
Trombone players will find the lightweight mute shown in the drawing of considerable value. It is made of felt of any color, although green has been found especially well suited for this purpose. The bell on my trombone is 7 in. in diameter, so I made the mute 8 in. across and of two thicknesses. Draw a circle, 12 in. in diameter, on a piece of felt and out of this disk make the rim that holds the mute in place on the bell. This strip is 2 in. wide and runs two-thirds of the way around the bell. Sew the outside of the rim to the outside of the center piece. When finished, the rim will stand out cone-shaped. The practicing musician will find this an ideal mute.—Irvin L. Oakes, Pleasant Hill, Ohio.

Spectacles Make Magnifying Glass

An old pair of spectacles can be changed to form a small magnifying glass, which is generally useful. The two eye wires are bent so that they are parallel, and exact focus is obtained by bending the nose piece so that the glasses can be pulled apart or brought together for more or less magnification.

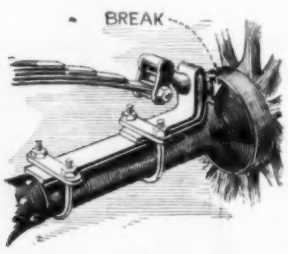
Sign Painters' Tool Box

Sign painters and window letterers are often inconvenienced when working on a stepladder, because the top rung does not afford sufficient space for their colors and brushes, and the least disturbance of the ladders causes them to fall off. One sign painter overcame the difficulty by attaching a material box to the top of the ladder as shown in the drawing. When closed, it provides a top step as on an ordinary ladder, but opened, reveals all the materials safely kept and with ample working space.—G. E. Hendrickson, Argyle, Wis.



Improvised Spring-Perch Holder

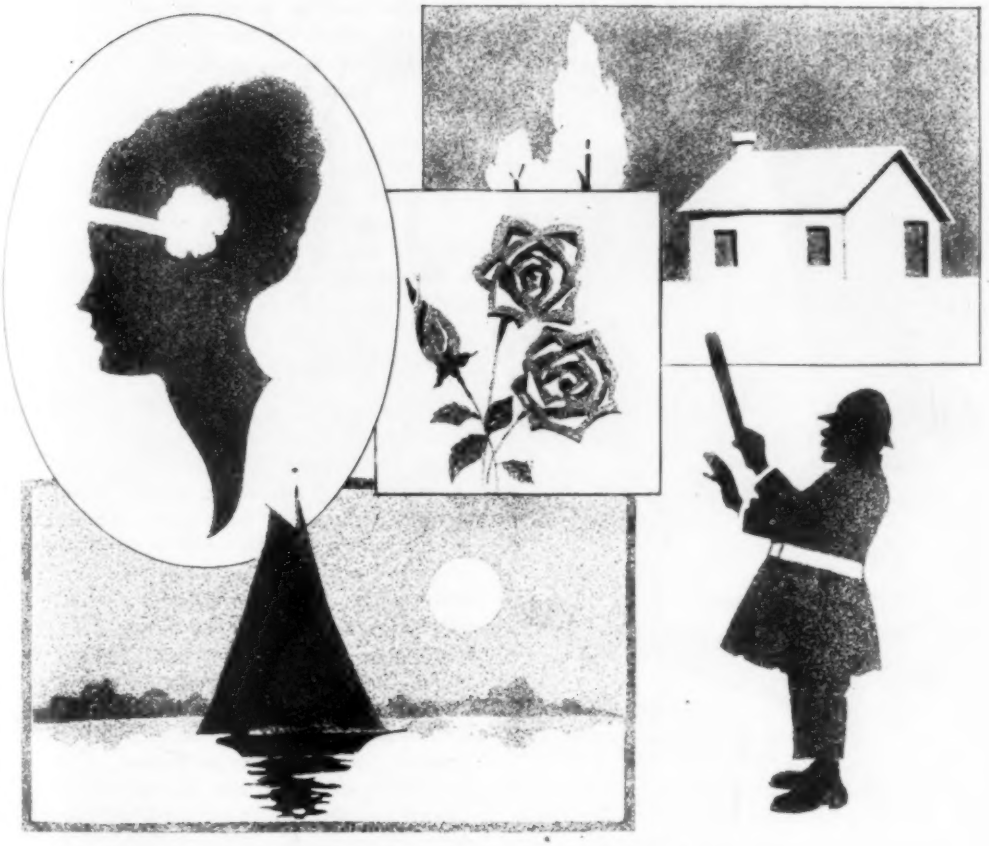
When driving over a rough place, the part of the rear-axle housing to which the rear-spring perch of a Ford truck is attached, broke, causing the end of the spring to drop down and rest on the housing. Not wishing to pay the price asked for a new piece, the owner repaired the truck quite cheaply in the following way: A bar of steel, having a diameter equal to that of the rear-axle housing, was obtained, and a piece cut off, making sufficient allowance for the lap and bend near the end. One end of the bar was lapped back, making that end thick and rigid. Then a hole for the perch was drilled near the end at which the bend was made. The doubled end was bent again to form a right angle, as shown in the drawing. It was also necessary to give it a slight bend where it rested against the top of the brake housing. Two U-bolts and two short straps were then made to fit the housing. The U-bolt next to the perch was made a little longer than the other one, because the doubled end of the strap necessitated the use of a longer bolt. The whole outfit was assembled as shown, and all nuts were tightened. While this repair did not allow the spring to return to its former position it saved the owner time and money.—B. Kennedy, McCool, Miss.



Ornamental Cigaret Holder

For the library or den a novel cigar and cigaret holder can be readily made from a block of soft pine and the cover of a discarded book. The bound pages are carefully removed from the covers and the pine block is cut to the exact size and shape of the bound pages. Four holes, neatly spaced and of a size sufficiently large to accommodate cigars and cigarets, are cut through the block, which is then glued firmly to the back and one side of the cover. If desired, half of an aluminum soap box may be fitted snugly into each of the holes to improve the appearance. The words "Cigars," "Cigarets," "Ashes" and "Matches," carved or painted between the holes, will add to the ornamentation, and appropriate wording may be placed on the outside cover. A slight staining of the ends and front edge of the block completes the holder.—L. M. Curtis, Venice, California.

If you sprinkle a carpet with salt before beginning to brush it, the dust will not rise; incidentally, the salt will improve the appearance of the carpet.



How to Make Spatter Silhouettes

Anyone Can Make Attractive Pictures by This Method Using Only an Old Toothbrush and a Knife

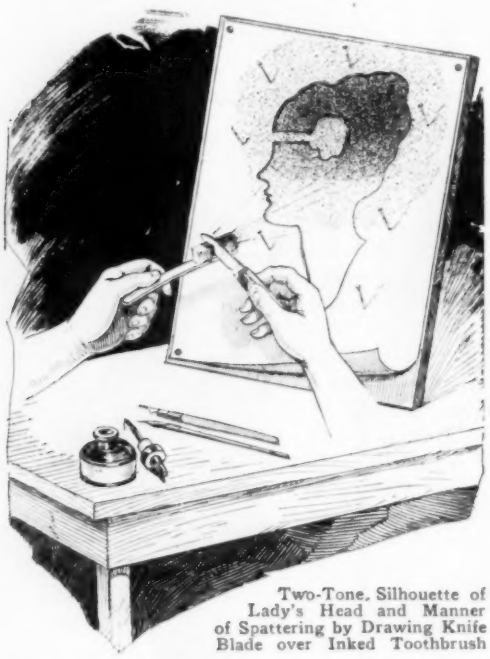
NO special equipment is required for the making of "spatter-work" silhouettes. The method described here is very simple and anyone can easily make very good silhouettes in this way. All you need is an old toothbrush, a penknife and some thin cardboard. Draw the outline of the desired silhouette on the cardboard and carefully cut around the picture with the knife. The cardboard should be laid on an old magazine and the cutting done with the point of the knife, which should be very sharp. Follow the outline exactly, as the value of a silhouette depends entirely upon the correctness of its outline.

The paper upon which the silhouette is to be made is placed on the drawing board with the cardboard stencil directly over it. Pins are used to hold them in place. Locate the pins as near the picture as possible so the stencil will be held close against the paper. Otherwise the silhouettes will be fuzzy around the edges.

The ink-spray or spatter treatment is applied with the toothbrush and knife. The drawing board should be placed on end while the spattering is being done. Pour a few drops of black drawing ink on the bristles of the brush and hold about 3 in. from the stencil. Draw the blade of the knife quickly across the bristles. This causes the ink to be thrown onto the paper in a fine spray. Any degree of "darkness" can be had, from a light gray to almost black.

For plain silhouettes, where but one

tone is required, one stencil only is needed. But for more elaborate ones of two or three tones as many stencils as tones are needed to make the picture. The



Two-Tone. Silhouette of Lady's Head and Manner of Spattering by Drawing Knife Blade over Inked Toothbrush

lady's head and the policeman illustrated are made with one stencil. The yacht picture is a two-tone silhouette and two stencils were required. The landscape and the floral sketch were made with one stencil, the black parts being laid in after the spattering was done.

In the two-tone silhouette of the marine scene, the sky only was cut out of the first stencil. This left the boat, moon and water covered. This stencil was only lightly spattered over. This rendered the sky in a light gray. The boat only was cut from the second stencil and this heavily spattered which made the boat and its shadow very dark. Notice the head and the house. In the former the object was cut out, while in the latter every thing was cut out but the object. This reverses the combination and produces an entirely different style of picture. Many different combinations can be worked out to produce different effects and very artistic pictures can be made with four or five tones.

Old postal cards are good to use in small work in making the stencils. Outline the object on the card and cut out as already described. The point of the knife must be very sharp to insure a clear outline. Profile photos can be used to make silhouettes of your friends.

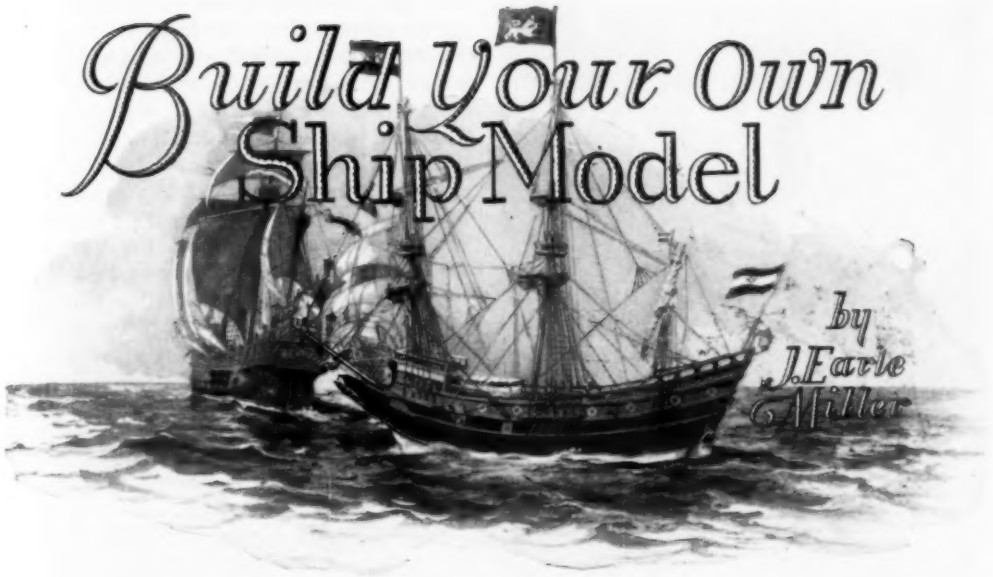
Do not put very much ink on the bristles of the brush at one time, for, if heavily loaded, it will be apt to throw some big spatters which will spoil the work. The blade of the knife should be drawn rapidly across the bristles so as to throw a fine spray. Do not remove the stencil until the ink is perfectly dry.

Swinging Furnace Door

To eliminate the necessity of closing the furnace door each time a shovelful of coal is thrown in, a swinging door of heavy sheet iron will be found useful One edge is bent around an iron rod, which serves as the hinge. Both ends of this rod are threaded and nuts screwed on. Holes a trifle larger in size than the diameter of the rod are drilled in the sides of the furnace and the rod is pushed into these holes. The nuts are then screwed against the sides to hold the rod securely in place. When feeding the fire, the shovel is simply pushed against the swinging door, its load deposited in the furnace, and the shovel withdrawn, the door shutting automatically.—E. K. Wehry, Cedar Rapids, Iowa.

Heavy Sheet-Iron Swinging Door in Furnace Found Convenient

Build Your Own Ship Model

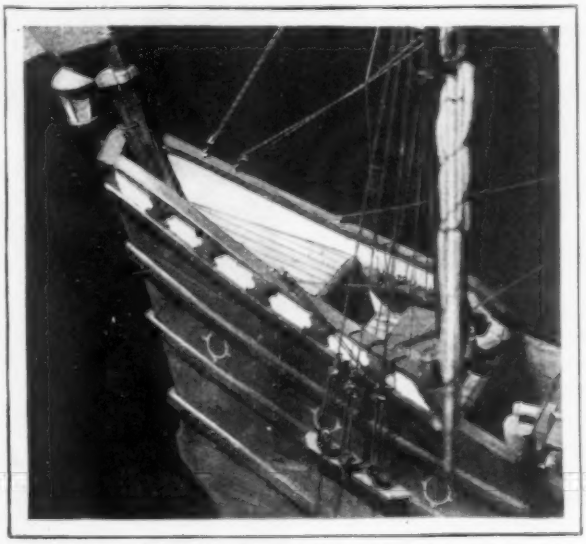


by J. Earle Miller

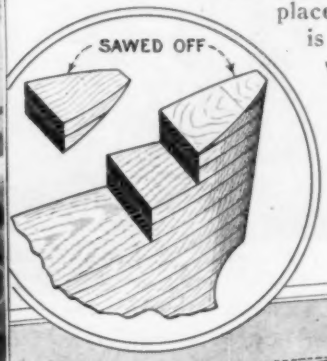
SHAVE the bow lines down to the edges of the lifts, but do not finish the bow at this stage, since a wooden stem piece must later be fitted here.

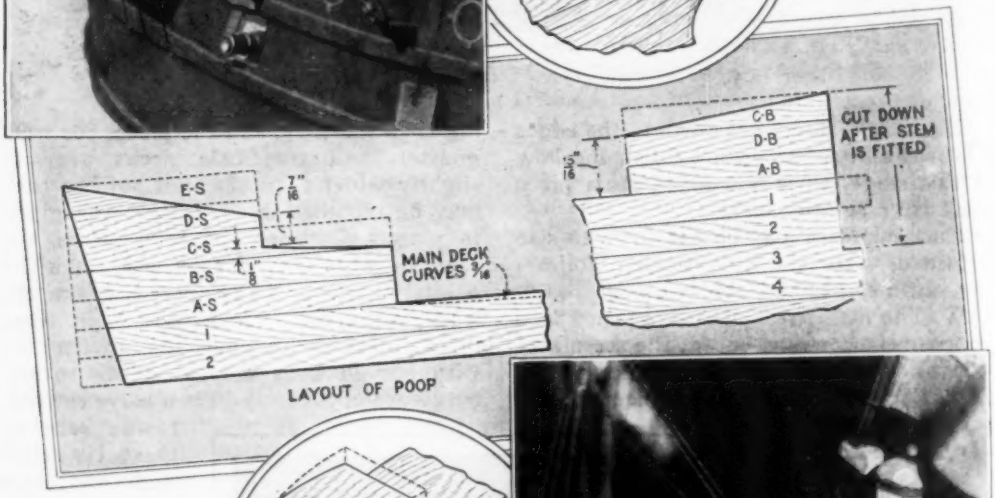
The deck lines may be cut down to size before or after the hull carving, following outline, marked side view of rough hull. The main, or well deck, in the space between the forward end of the stern section and the rear of the forecastle, is slightly curved, being 3/16 in. deeper at a point 5 in. forward from the stern section, than it is at the ends. Extreme care is not necessary in cutting down, because the surfaces will be covered by the deck planking.

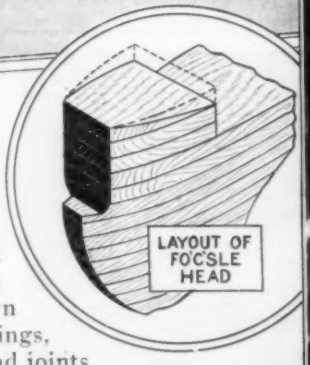
If clear white basswood is available, it makes excellent decks, but a selected piece of clear white pine will do in its absence. The deck planking is 3/16 in. thick, and the pieces for well, quarter, and forecastle decks are cut slightly wider than the hull so that they may be trimmed down after being glued in place. Cut out the four pieces, lay them in place and, at each end, mark the points where the edges, after they are finished, will come. Measure in 1/8 in. from these points, and connect the inner marks with curved lines corresponding to the curvature of the hull. Then halve the distance between these lines at each end, and connect the centers with a straight line. On either side of this straight line lay off parallel lines 3/16 in. apart. With the point of a knife, score the edge curved lines and the other straight ones lightly, and then, with a well-sharpened pencil, run lines in the knife cuts. Next, at



View of Quarter, Showing Rake of Bulwark and Quarterdeck, Also Deck-Plank Lining







Upper Left, Fo'c'sle Head and Deck on Finished Model; Center, Poop and Fo'c'sle Layout; Lower Right, Photo of Stern

look old and well worn. After the shellac has dried, glue the decks in place and then trim the edges down to meet the hull lines. It is not necessary to clamp them on and wait for the glue to set. They can be nailed in place with small brads or pins, cut down to brad size, and later the heads can be countersunk and puttied over.

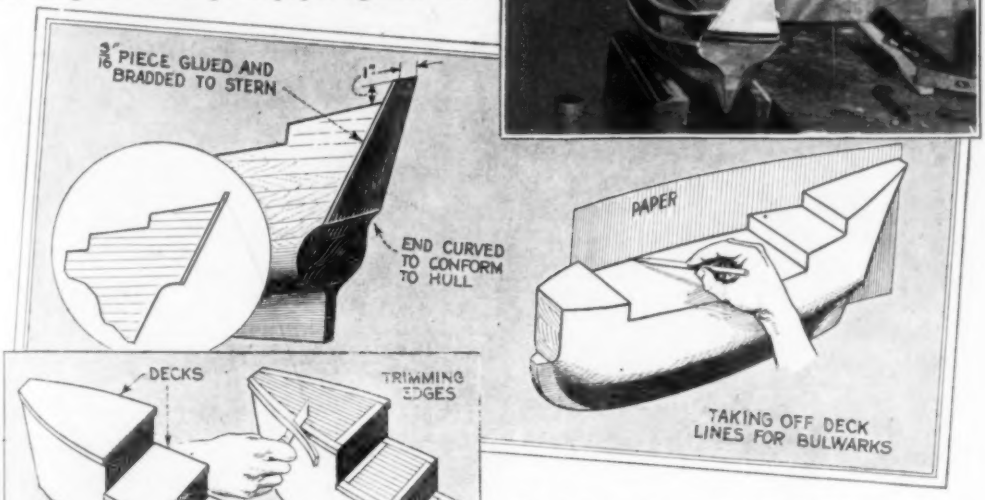
After the decks are in place, the next step is to make the bulwarks around the forecastle top and stern superstructure. Cut a piece of 3/16-in. thick white pine or

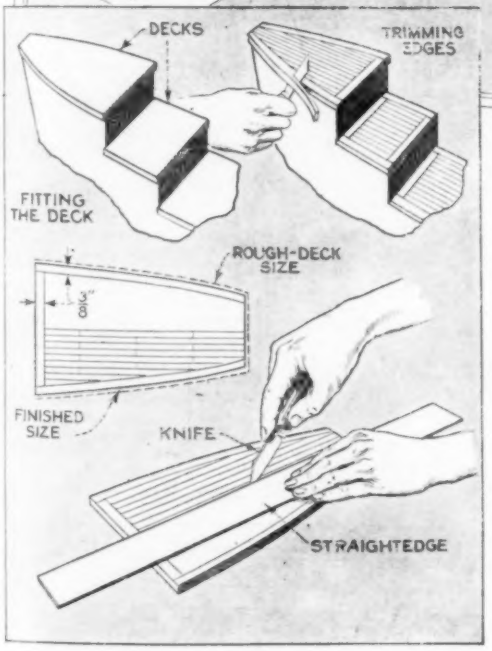
intervals of 2 in., cut and pencil in cross marks in the planking, as shown in one of the drawings, to represent the end joints.

If you wish to show the deck spikes they can be pricked in with a needle point and brought out with a sharp pencil. After all the deck planks are marked, sand the surface clear of dirt and then shellack it. The sanding process will dust over the pencil marks in the grooves and dim their newness, so that the shellacked surface will

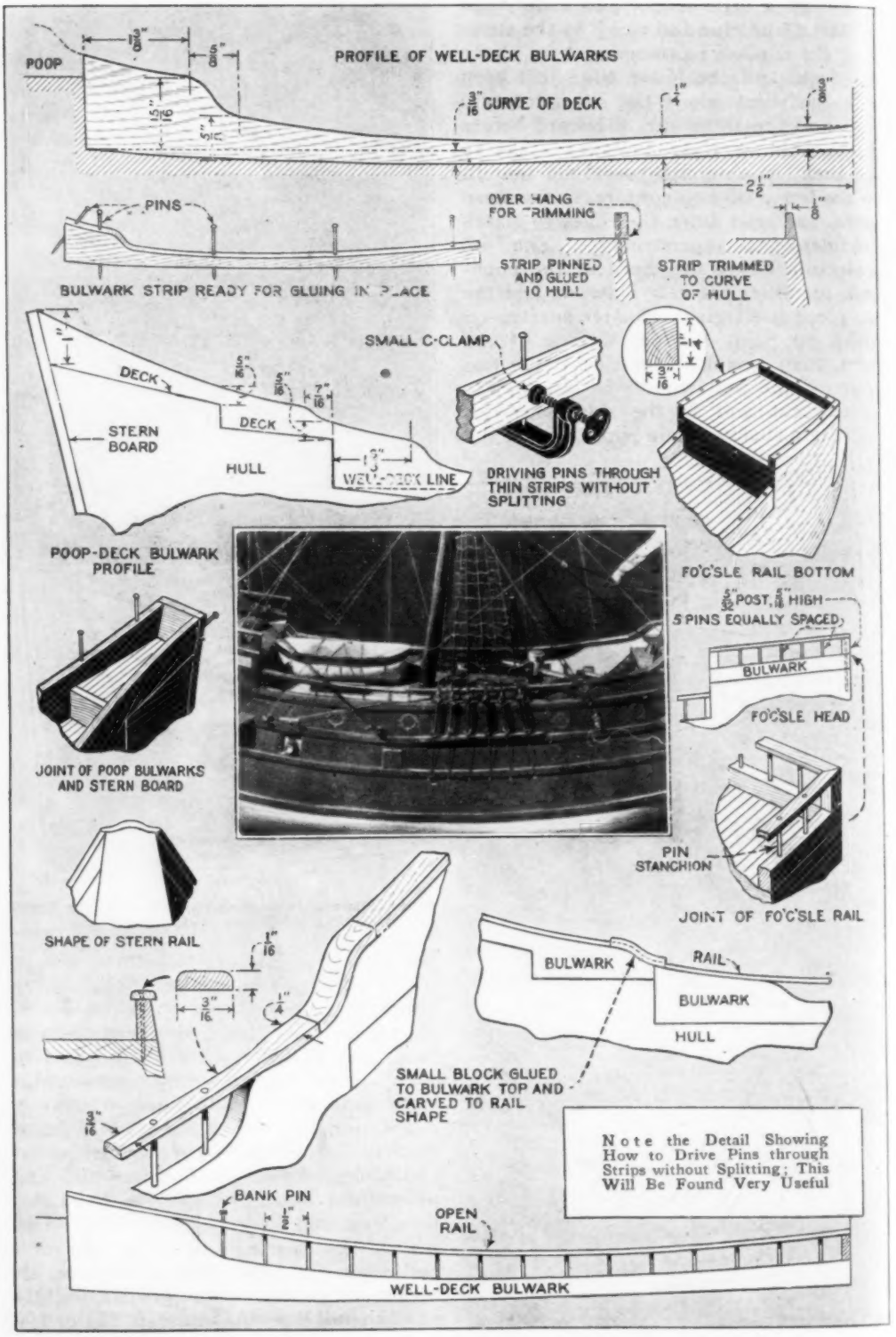
basswood, a little longer and wider than the stern, and glue and nail it to the stern, with the top edge projecting 1 in. above the deck, and the lower edge just even with the point where the superstructure ends and the stern curves inward before starting the straight downward rake to the keel. With a half-round file smooth off the lower edge to conform to the stern curve, and trim down the edges to match the sides of the superstructure. The 1-in. projection above the stern of the poop-deck furnishes the rear bulwark, and the flat piece itself gives a better surface on which to paint the decorations of the stern, than would be the case if the end grain of the hull wood was left bare.

Next cut and fit the side bulwarks. Holding a sheet of plain paper against the side of the ship, the deck lines can be traced on it, to give the lower edge of the bulwarks. They should be sawed out of ¼-in. soft white pine, and carved down to ⅛ in. in thickness, after being glued in place. The bulwarks take considerable curving to fit the hull lines, which accounts for the need of the extra ⅛ in. of material. After they have been sawed out and fitted, take several ordinary pins and drive them down through the bulwarks, then coat the lower edges of the strips with glue. Starting just aft of the forecastle, pin the bulwark strip in place, allowing its outer edge to project slightly past the hull line. At intervals of 1 or 1½





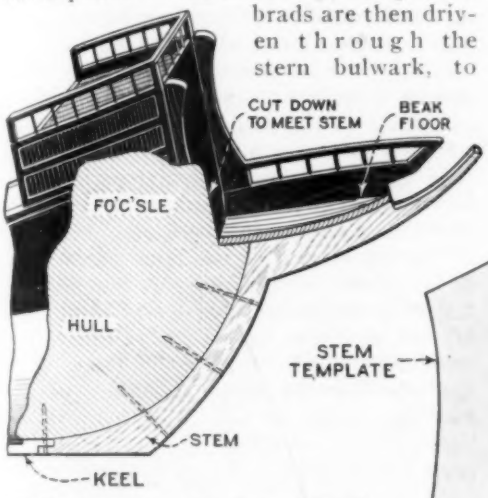
Above, Photo Showing Half-Finished Hull; the Drawings Illustrate Details of Hull Construction


PROFILE OF WELL-DECK BULWARKS
POOP
CURVE OF DECK
PINS
BULWARK STRIP READY FOR GLUING IN PLACE
OVER HANG FOR TRIMMING
STRIP PINNED AND GLUED TO HULL
STRIP TRIMMED TO CURVE OF HULL
SMALL C-CLAMP
DECK
STERN BOARD
HULL
WELL-DECK LINE
DRIVING PINS THROUGH THIN STRIPS WITHOUT SPLITTING
POOP-DECK BULWARK PROFILE
FO'C'SLE RAIL BOTTOM
POST, HIGH
5 PINS EQUALLY SPACED
BULWARK
FO'C'SLE HEAD
JOINT OF POOP BULWARKS AND STERN BOARD
PIN STANCHION
JOINT OF FO'C'SLE RAIL
SHAPE OF STERN RAIL
RAIL
BULWARK
BULWARK
HULL
SMALL BLOCK GLUED TO BULWARK TOP AND CARVED TO RAIL SHAPE
BANK PIN
OPEN RAIL
WELL-DECK BULWARK
Note the Detail Showing How to Drive Pins through Strips without Splitting; This Will Be Found Very Useful

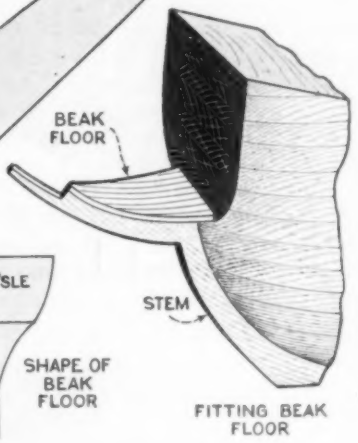
in., working toward the stern, drive in additional pins, bending the bulwark strip to fit the hull line, but always allowing it to project slightly, so that it may later be shaved, filed and sanded down to fit. When you reach the break of the quarterdeck, where it rises above the main deck, drive a long pin down to hold the bottom of the bulwark strip in place, then bend the top in to follow the hull curve, and, with a pin driven diagonally back into the quarterdeck structure, bind it in place. The second bulwark strip, above the quarter and poopdeck, requires less bending, but is placed in the same way, and pins or brads are then driven through the stern bulwark, to tie it to the side strips. After the bulwarks are in place, carve the outer surface down to fit the hull lines and then, with a knife, shave off the inside until the bulwark has been reduced to ⅛ in., at the top at least. The shaving process will reduce the overhang and widen the deck space.

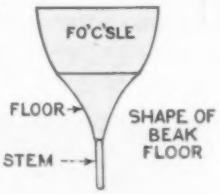
The forecastle bulwarks, around the two sides and front, are ¼ in. high and 3/16 in. thick. The strips that are to go along the sides of the bulwarks must be bent to conform to the curvature of the forecastle. Cut them to size and length and drop them in a kettle of boiling water for a half hour, by which time they will be pliable enough to be glued and pinned in place.

The rails on top of the solid bulwarks aft, and the open rails of the well deck and forecastle come next. Those on the solid bulwarks are 1/16 by ¼ in., cut from white pine, and with top corners slightly rounded with sandpaper. The top rail of the stern bulwark is whittled out from a strip ¼ in. thick, and the curving rails at the break, where the bulwarks drop from the poop to the lower level of the quarterdeck, are whittled out and fitted in the same way. Next, glue the straight rails along the bulwarks from the stern to the break, and then cut the long pieces, which stretch from the break to the forecastle. Before gluing them in place, the portion that is to be left as an open rail, can be shaved down to 7/16 in. in width, since it has no solid bulwark to project over. Mark the open-rail section, and at ½-in. intervals drill holes through it with a No. 60 drill. Then cut two small pieces, 1/16 in. thick, ⅛ in. wide and ⅜ in. long, and glue one on top of the bulwark and to the forecastle on either side, on which the rails will rest. Glue the rails in place, and you are ready to put in the stanchions of the open rail-



Full-Size Template of the Stem and Detail of How It Is Fitted





FITTING BEAK FLOOR

ing. These are made from the long, heavy pins known as "bank pins." Cut them off 5/8 in. from the point, lay the tops away for future use, and use the point sections for stanchions. Push them through the holes drilled in the rail, slip a 3/8-in. block between bulwark and rail, and drive the pins down into the bulwark. If the latter shows a tendency to split, take one of the small metal clamps and tighten it on the rail at the point where the pin is penetrating. After the pins are all driven down flush with the rail top, they may be countersunk slightly, and the holes filled with putty or a prepared crack and crevice filler.

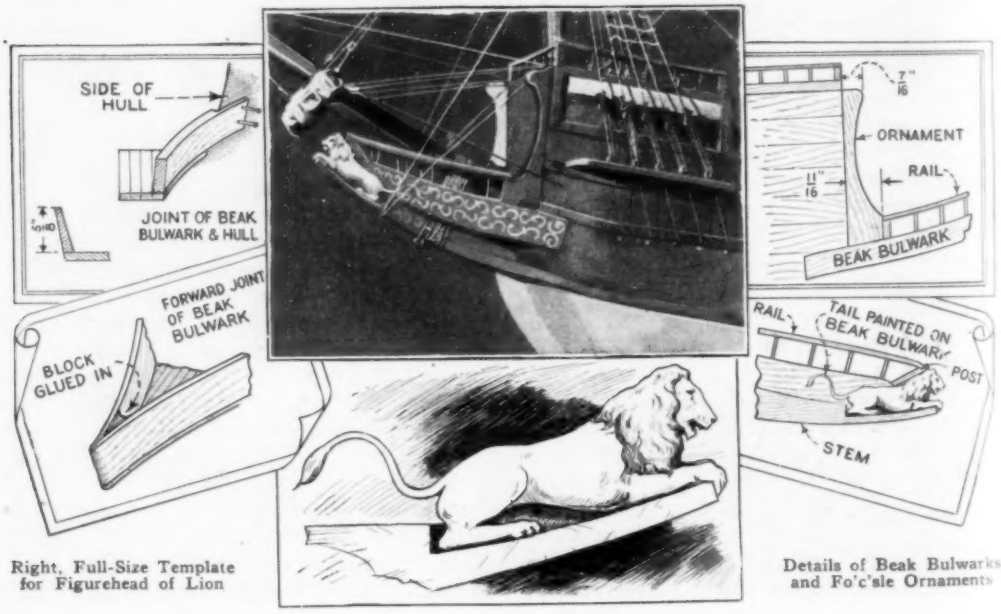
The fo'c'sle bulwark rails are made in the same way, except that the corner posts are of wood, 1/8 in. square and 3/8 in. high. Clamp the posts in a vise and carefully drive small pins down to help the glue hold them in place. Then glue the rails on top and add the pin stanchions.

The next step is to build the beak, which, in these old ships, still retains distinct traces of its ancestor, the fighting beak of the Roman galleys.

Using the template on page 853, lay out the stem on a piece of white pine or basswood, 3/16 in. thick, turning the template in such a way that the grain of the wood will run as straight as possible with the thin fore-end, to which the deck of the beak must later be fastened. The stem is designed to project slightly under the hull, and later the keel will be joined to it and continue aft.

Glue and pin the stem to the hull and then, with a handsaw, cut the bow straight down from the front end of the forecastle to the level of the stem top. Next saw out the beak floor from 3/16-in. white pine, and mark the deck planking in the same manner as for the main decks. Glue the floor in place and you are ready to start building up the bulwarks. Their lower edges, where they join the floor, are beveled at an angle of about 30°, so as to give them an outward flare. They can be cut from 1/4-in. white pine, and at the rear end 5/8 in. is whittled down to a thickness of 1/16 in., to bend around and join to the hull, as shown in the detail sketch. It will be necessary to steam them by boiling. A half dozen of the small clamps will not be too many to hold them as they are bent, glued and pinned in place.

The figurehead of the lion comes next. It is carved from 3/8-in. soft wood. Cut a strip to the proper length and height and lay out the lines shown in the figurehead drawing (actual size) on this page. The space under the belly and back of the hindlegs is carved out, but the pairs of legs are not separated. Instead they run through the full width, for greater strength.



Right, Full-Size Template for Figurehead of Lion

Details of Beak Bulwarks and Fo'c'sle Ornaments

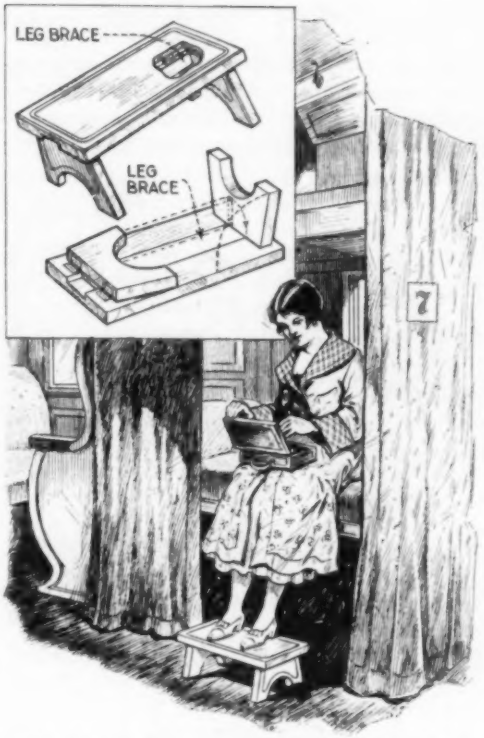
Glue the figurehead in place on top of the projecting end of the stem and beneath the front end of the bulwarks. A small stanchion, ⅛ in. square and ⅜ in. long, fastens on top the bulwarks and extends along the lion's back to form the forward support of the beak rails.

The ornamental extensions of the bulwarks up the sides of the forecastle come next. They are from ½-in. stock, carved out to fit the curves of the hull, and brought down to a finished thickness of ⅛ in. Their side view is shown in the detail, and further dimensions are valueless, since they can best be fitted to the hull and beak by cut-and-try methods. The rails from these pieces to the strip above the lion's back, and the pin stanchions, are added in the same way as those on the other decks.

(To Be Continued)

False Eyes Make Comic Design

This pair of false eyes can be made by anyone. The eyes themselves are made from two oval pieces of heavy white cardboard, about 1¼ in. long by 1 in. wide. Soak them in water until pliable and then lay between two spoon bowls, pressing the two, until the paper becomes convex, with a weight. Let the paper dry for 24 hours. Paint the convex sides like eyes and glue between them a wire bow as shown. Drill a small hole in each pupil. Place this pair of glasses on your nose so that they cover your eyes completely. You can see through the holes well enough to get about and the disguise will prove very comical, especially if the eyes are made to represent crossed eyes or are of different colors.



Small, Collapsible Footstool Found Convenient When Sitting on Pullman Berth

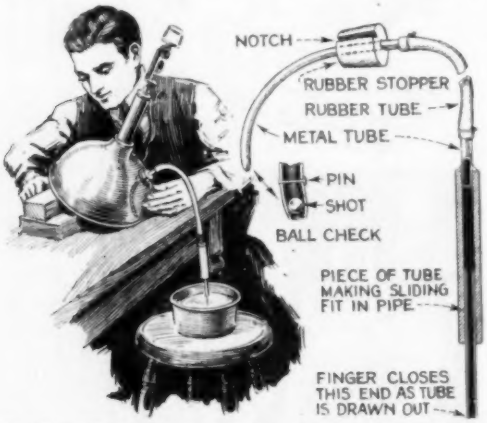
Small Footstool Convenient on Train

A rather short woman whose feet could not touch the floor when she sat on the berth of a railroad coach, carried with her a little collapsible footstool. The construction of the stool is shown in the drawing. It is about 8 or 10 in. long, 6 in. wide and about 3 in. high. When in use, the sides are braced and held in position by a 1-in. strip of wood, which is hinged to the underside of the top. When the stool is collapsed, this strip is pushed into a groove cut for this purpose, so that it is flush with the underside of the top, and then the sides are folded in. The legs can be made more or less ornamental.

¶After burning soft coal all winter, the chimney is so dirty that a fire in it may occur. An easy way of cleaning it is to throw a piece of sheet zinc about 4 by 4 in., into the furnace when there is a hot fire. This will change the soot into small white flakes so light that the draft blows them out of the smokestack.

Draining Vapor Lamps

Vapor lamps burning kerosene or gasoline depend upon clean fuel for the best operation. Dirty liquid must be removed before it carbonizes or clogs the delicate

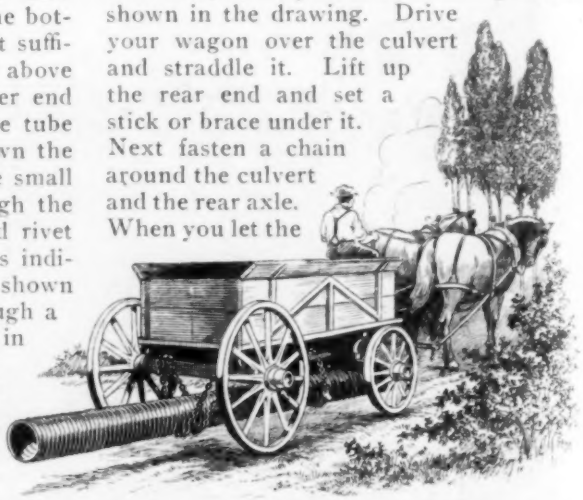


Getting All the Dirty Gas Out of Vapor Lamps with a Siphon

jet in the burner. Getting all the gasoline out of the lamp by inverting it is almost impossible, but by using a siphon, as shown in the drawing, the job is easy. A siphon can be made as follows: Straighten out two old generator tubes and force out the asbestos filling with a steel wire. Saw off one tube so that it will reach the bottom edge of the fount by curving it sufficiently and will project a short way above the fount. Slightly pinch the lower end so that a lead shot, dropped in the tube from the top, will travel easily down the tube, but will not come out of the small end. Then drill a fine hole through the tube, ½ in. above the bottom, and rivet a piece of pin through the tube, as indicated. This forms a check valve, as shown in the detail. Push the tube through a rubber stopper with a notch cut in the side to make an air intake to the fount. When properly adjusted the check valve should nearly touch the bottom of the fount with the cork in place. Then fit about 2 ft. of rubber tubing to the top of this tube. Make a suction pump from a 4-in. length of brass tubing with an inside diameter just large enough to let the generator tubing slide up and down in it. Solder a short piece of the smaller tubing in one end and in the other end insert a 4-in. length of generator tube that has been straightened perfectly. The flanged end may be used for the plunger and can be filed down to make a snug fit. The operation of the siphon is as follows: Tip the lamp at an angle on the table and arrange a pan at a lower level near by. Insert the first tube and let the suction pump hang over the pan, always at a lower level. Push the plunger of the lamp almost in and, placing the finger over the opening, pull the plunger out sharply nearly its entire length. Repeat this two or three times, and the liquid will be drawn up and flow by itself out of the open end of the plunger. Each time the plunger is drawn out it pulls the liquid up, which cannot return because of the check valve. Two or three such operations will fill the tube so that the siphon is started. To work properly, the generator tube must be a good fit in the brass tubing.—L. B. Robbins, Harwich, Mass.

Sling for Transporting Culverts Single-Handed

Moving culverts or tubes made of corrugated steel is quite a heavy task for one man when they are 16 or 18 ft. long. However, an easy method of doing this is shown in the drawing. Drive your wagon over the culvert and straddle it. Lift up the rear end and set a stick or brace under it. Next fasten a chain around the culvert and the rear axle. When you let the culvert down it will be suspended beneath the wagon as shown in the illustration. A chain may then be fastened around the culvert and the coupling pole of the wagon.



Moving Long Culverts Is No One-Man Job, But This Method Is an Easy One

How to Make a Sewing-Basket Taboret

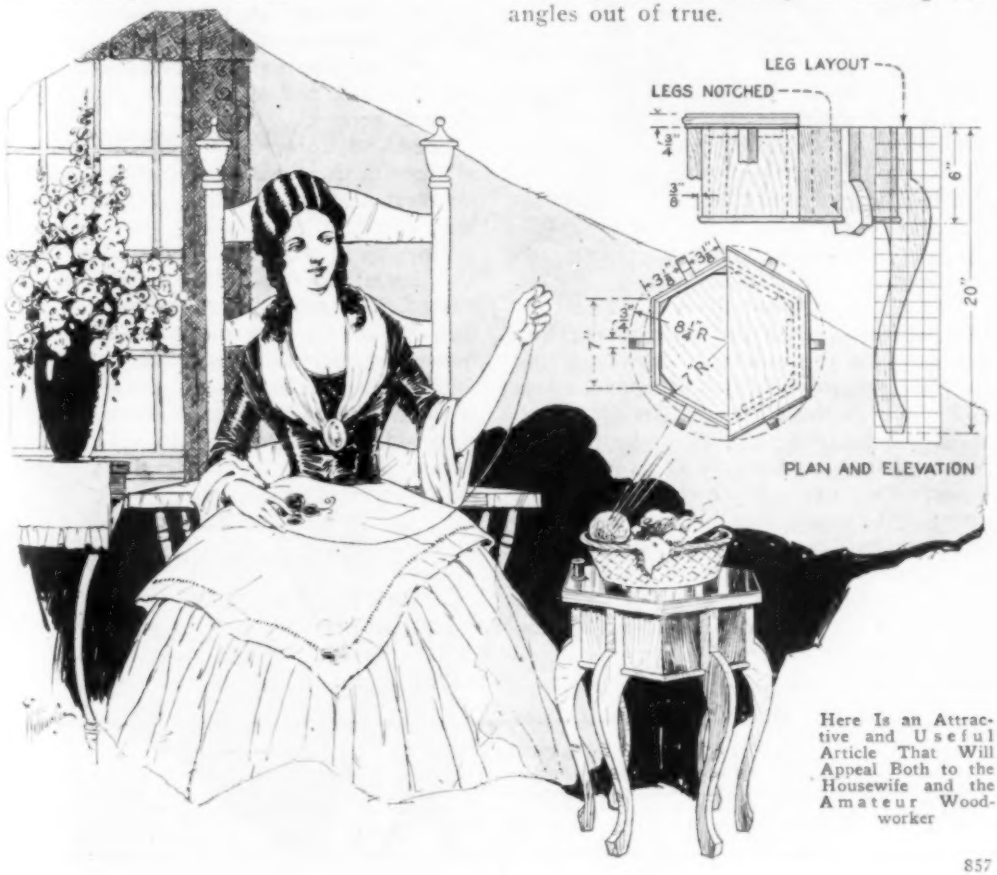
By EDWIN M. LOVE

THE combination of a sewing basket and a taboret results in the easily built, yet attractive and useful piece of furniture illustrated here. It may be of hardwood, stained and varnished to match the room furnishings, or may be of soft wood finished in enamel.

For the top, glue up two widths of 1 by 8-in. stock, putting in three ⅜-in. hardwood dowel pins, 3 in. long. After drying scribe a circle of 8¼-in. radius, and lay out the hexagon illustrated by stepping around the circumference with dividers set to the radius. Saw out carefully, and smooth the edges to dimensions. Glue and nail, with fine brads around the top edges, a ½-in. half-round mold, joined at the corners by cutting the ends to an angle of 60°. Show a margin of ⅛ in. above and below this molding, as indicated.

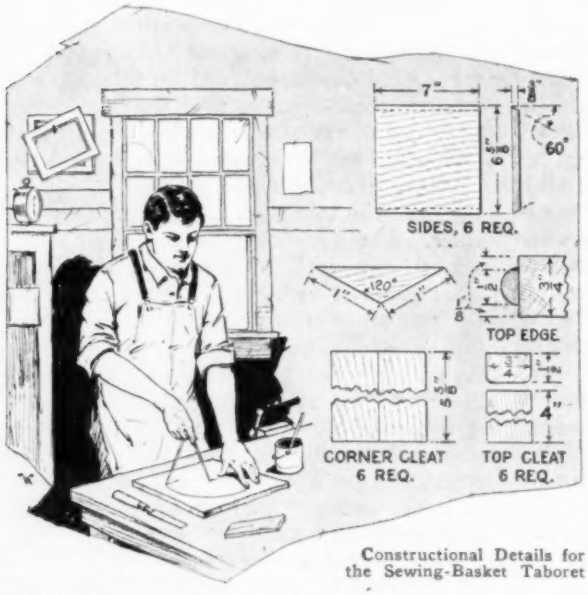
The mold is easily made by squaring up a strip to a rectangular section ¼ by ½ in., afterward planing off the corners to make a half-octagon, and finishing by removing these corners and sanding. After applying to the top, it may be found that one piece projects beyond its mate. In working it down, slope gradually.

While the top stock is drying, make the sides. These are of ⅜-in. three-ply panel veneer, cut with the grain of the outer plies running vertically. Make them 5⅝ in. long and 7 in. wide, the joint edges being beveled to an angle of 60°. It will be found very handy to cut an angle template of 1-in. stock to press against the saw in cutting. With a fine-toothed saw, and careful guiding, no planing of these edges will be necessary; but if the plane is used, avoid rounding or cutting the angles out of true.



Here Is an Attractive and Useful Article That Will Appeal Both to the Housewife and the Amateur Woodworker

Make six hardwood corner beads of triangular section, as shown, to reinforce the corner joints of the box. The two 1-in. sides make an angle with one another of 120°. Rip two of these down the center to allow of spreading for the partition.



Constructional Details for the Sewing-Basket Taboret

Glue, and nail with brads, one bead to the inside of each joint edge of two of the sides. Take care that they line accurately. Then unite the other sides, and insert the ⅜ by 5⅝-in. pine partition, gluing and nailing in the half beads.

Use a single piece of ⅜-in. stock for the bottom. After the glue in the box has set (the top is shaped while waiting for this), smooth off top and bottom edges and place on the bottom material. With a sharply pointed pencil trace around the box, and with scribers set at 3/16 in., scribe a second outline. Mark the bottom and one side to make certain that in assembling they will mate, since a possible irregularitiy of the box would otherwise mean an uneven projection of the bottom. Cut out, following the outer line, and work a half-round on the edge. Then nail in place on the box assembly.

Prepare a template for the leg layout by dividing a 4 by 20-in. rectangle of cardboard into 1-in. squares, upon the lines of which the outline intersections can be located as they are in the drawing. When a smooth outline is obtained, cut out, and trace the six legs on 1 by 6-in. stock, nesting them together for economy of material, but keeping the grain vertical. They may be cut out with a compass saw and smoothed with spokeshave, woodrasp and sandpaper. Notice that they notch under the bottom.

The legs are centered on the box sides. Bore and countersink on the inside for No. 10 wood screws, two holes for each leg, keeping them 1¼ in. below the top and above the bottom. Outside, square down guide lines for the leg faces, and notch the projecting edge of the bottom. Try the legs in place and mark the screw positions. Drill small holes to prevent the screws from splitting the legs, and attach with glue as well as with screws.

Set the taboret on a smooth floor. If all legs do not touch, set scribers to the shortest and scribe all legs. Cut off the long ones.

Now lay the top face down on the bench and invert the stand upon it. Having moved the stand to show an even projection of the top all around, trace the outline with a pencil. Screw six ½ by ¾ by 4-in. cleats ⅜ in. inside these lines, to serve as guides in holding on the removable top. Sand thoroughly, sponge with a damp cloth to raise the grain, and sand with 00 paper. Finish as desired.

MATERIAL LIST

1 piece, 1 by 8 in. by 4 ft., hardwood, S4S, sanded.
1 piece, 1 by 6 in. by 5 ft., hardwood, S4S, sanded.
1 piece, ⅜ by 16 by 16 in., hardwood, S4S, sanded.
1 piece, ⅜ by 16 by 18 in., three-ply panel veneer.
1 piece, ⅜ by 6 by 16 in., pine, S4S, sanded.
2 doz. No. 10 1-in. flat-head wood screws.
A few 1-in. brads.

Keep Up Balloon Pressures

Balloon tires, to a much greater extent than high-pressure tires, are sensitive to the slightest loss of pressure. A loss of 5 or 10 lb. in the balloon tire not only re-

duces its life, due to the greater flexing load imposed on the walls of the casing, but makes steering harder and increases the tendency to shimmy. It pays, therefore, to watch the tire pressure closely, checking it twice a week or oftener. Many motorists have found that the tire mileage is greatly increased by carrying pressures two or three pounds above that recommended by the manufacturer of their car. For example, on one well-known six the pressures recommended are 30 lb. for the front tires and 35 for the rear. It has been found by experience, however, that a pressure of 38 lb. both front and rear not only results in easier steering, but in a reduction in tire wear of from 30 to 50 per cent, without any appreciable loss of riding comfort. Of course, the increase in pressure must not be carried to extreme. Two or three pounds above the pressure recommended is enough, and the car owner will do well to consult his dealer or service manager about the matter, as they can give him the results of many other owners' experience, as well as that of their own demonstrators.

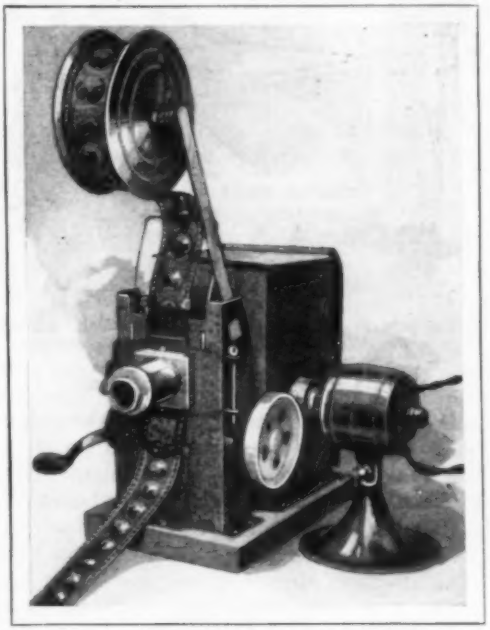
Straightening Wire

Wire can be easily drawn out in perfectly straight lengths in the following way: Cut it off in 2-ft. lengths, chuck one end in the hand drill and the other end in a small vise, as shown in the illustration, and give the wire a number of turns, which will straighten it out immediately. Of course, one must bring the wire under tension while twisting it, and its size, condition and flexibility determine how many twists to give it. It was found that No. 14 copper bus wire, such as is extensively used in wiring radio sets, could be straightened by giving it five or six twists. —E. R. Haan, Chicago.

Easy Method of Straightening Wire with a Hand Drill and a Vise

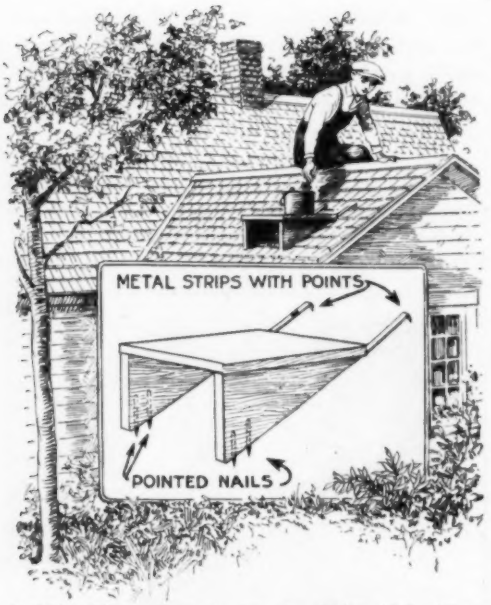
Toy Moving-Picture Machine

The photo shows a toy moving-picture machine with a motor drive. The motor



Improvised Motor-Drive for a Toy Moving-Picture Machine

is taken from an electric fan, the guards and blades being removed and a cork wheel mounted on the shaft. The wheel is made as follows: Take the spool of an A-130 Kodak film, saw it $\frac{9}{16}$ in. long and trim the end so that you can mount the flange from the discarded end on it. From a cork, $1\frac{1}{2}$ in. in diameter, cut a wheel $\frac{1}{2}$ in. thick and mount it between the flanges of the spool. Then mount the spool on the shaft of the motor and place the motor so that the cork wheel is in contact with the flywheel of the moving-picture machine. It will be better to fasten the moving-picture machine to a table or bench by means of a couple of screws to prevent it from twisting. It is not necessary to fasten the motor, as it will stay in any position placed. — Carl Osborn, Charleston, S. C.



Quickly Made Support for the Paint Pail Allows Worker to Use Both Hands

Roof Platform for Paint Pail

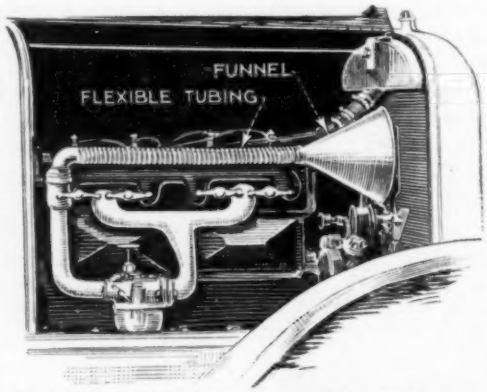
If you have ever tried to paint the ridge boards on the roof, or some point projecting above it, you know how difficult it is to keep your balance and hold the paint pail at the same time. A platform for the pail, that can be placed anywhere on the roof and will keep the pail level, can be made in a few moments. Cut out two pieces of board of such a shape that the top edges will be horizontal when the long, or bottom, edges rest on the roof. Nail a wide board across the top of these boards to make a platform. Fasten a narrow strip of metal to the bottom of each side and sharpen the ends of the strips to points and bend them downward. Drive two or three nails into the bottom edge of the sides near the wide end and file the heads to a point. These nails should slant somewhat toward the rear. By pushing the pointed metal strips under the shingles and pressing the points down into the shingles, the platform is prevented from rising, and the sharpened nails at the rear keep it from slipping down. This makes a level platform on the roof and the painter can work freely with both hands.—L. B. Robbins, Harwich, Mass.

Preparing Floor Wax

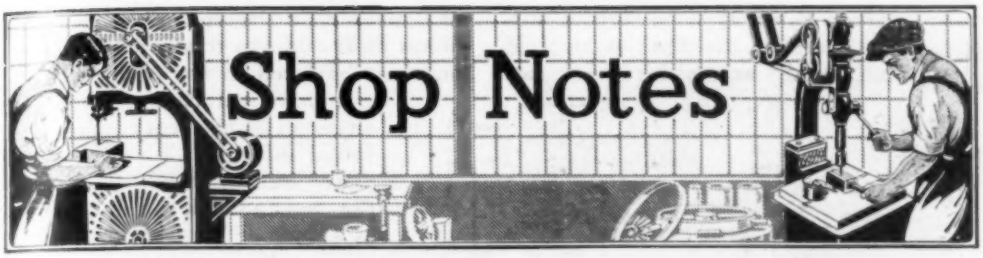
Many amateurs who have had trouble in using floor wax seem to think that it is possible to use it just as it comes from the can. This is the cause of all gray spots, which are due to uneven work by using wax that has not been properly treated. For best results, floor wax should be reduced as follows: Remove a small quantity from the can, add a little linseed oil, and add turpentine sufficient to reduce to a thin paste. This should be done no matter what the wax is used for. A more even job can be done and the work of polishing will be much easier.

Supercharger for Small Auto

Racing cars as well as several of the more expensive European cars are fitted with superchargers, which are devices that put the air supply of the car under some pressure instead of depending on the vacuum created in the cylinder, as is the case with the ordinary auto carburetor. This pressure system gives a decided increase in speed and power as well as greater gas economy. These superchargers are too complicated and expensive for the average small-car owner, but anyone can make a simple device that uses the air thrust from the fan to create the necessary pressure. It consists of a large funnel, fitted close behind the fan to catch the air and connected to the air inlet of the carburetor by a piece of flexible tubing such as used on exhaust heaters. This arrangement also brings warm air into the carburetor.



Increased Speed and Power, and More Mileage per Gallon Are the Results of This Installation



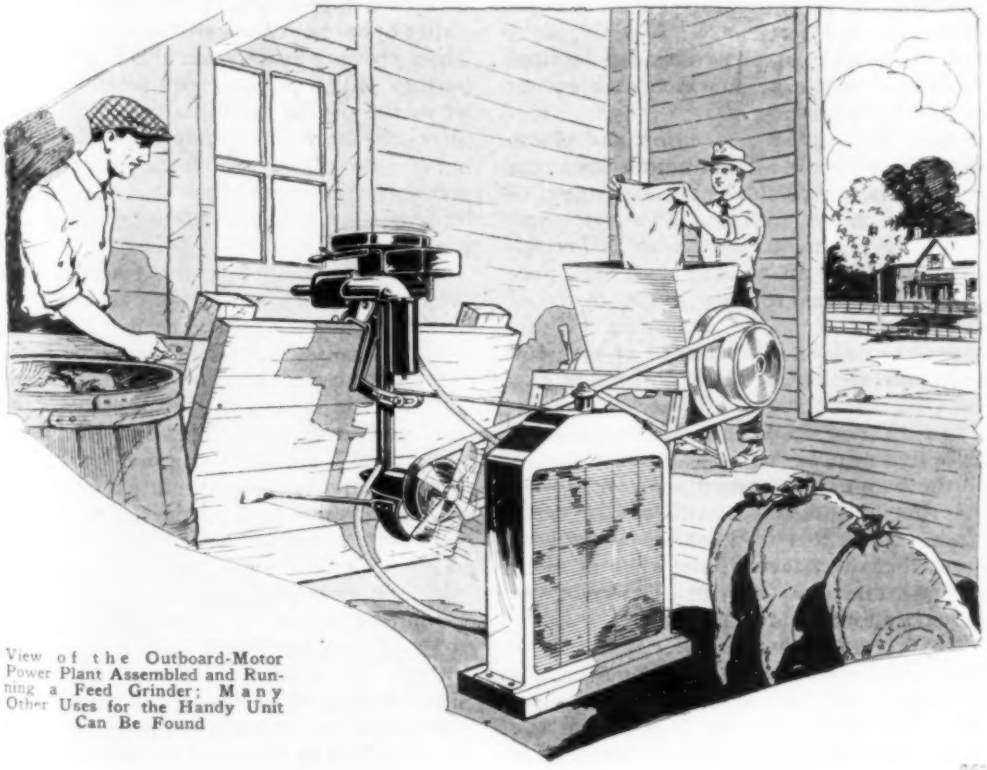
All Shop Notes published in 1925, in book form—Fifty Cents—from our Book Department

Use Your Outboard Motor for Power

By LAWRENCE B. ROBBINS

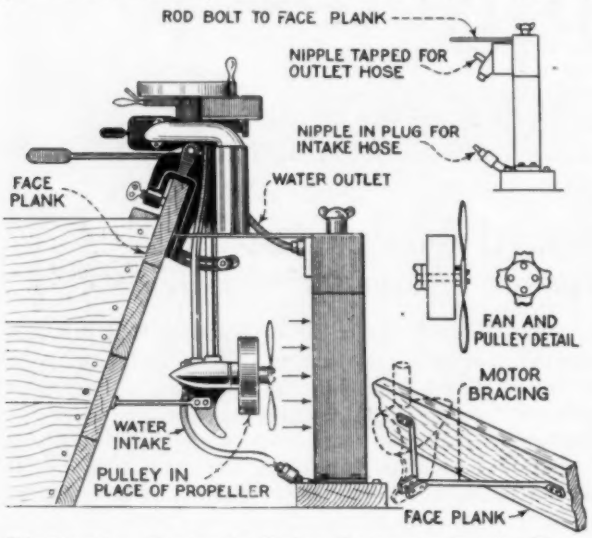
AN outboard boat motor is seldom used for more than three or four months of the year, but the man who likes to tinker and build things during the winter days can utilize it as a serviceable power plant for his basement or barn shop. It will function perfectly in driving small machinery, such as drills, bandsaws, bench lathes, etc., and if properly installed and operated can do the motor no harm. The only accessories needed will be an automobile radiator and fan and some garden hose; also a bit of blacksmith work and simple pipe fitting. This latter may be hired done, but the handy man should be well able to prepare every part himself.

A solid wall should be selected upon which to build the motor support. It should be at right angles to the countershaft or machine to be operated. Cut out two wide planks, about 1 ft. taller than the height of the radiator and 1 ft. wide. Slightly taper them and spike or bolt them to the wall and floor with the smaller end



View of the Outboard-Motor Power Plant Assembled and Running a Feed Grinder; Many Other Uses for the Handy Unit Can Be Found

down. Place them at least 2 ft. apart, parallel and vertical, and then spike solid planks horizontally across the front. Let



Side Elevation, Showing the Various Construction Details; There Is Very Little Work Necessary

the top edge of the uppermost plank project somewhat above the ends of the upright boards so the motor can be clamped to it without interference. If wide planks are unavailable, smaller ones can be used as in the drawings, in which case corner posts are necessary.

Place the motor in position and clamp it solidly in place. Then plumb the vertical shaft from all sides and fasten temporarily in place with small battens and cords. Next, drill two small holes through the end of the fin or skeg under the propeller and fashion two angle irons of solid round stock, as indicated. These should be heated and flattened at each end and bent at angles which will allow two ends of the irons to be bolted to the fin. Then the two other ends of the iron can be bolted near each side of the face planks of the support, as shown. Be very careful that the motor shaft is absolutely plumb when this is finished. It will be noted that the steering handle should clear the wall and the depth of the top of the support should allow for this.

Next remove the propeller and substitute a small-diameter solid-iron pulley. To conform with the particular motor being used, it may be necessary to rebore the pulley hole and cut a new keyway, or it may mean that the entire propeller and pinion pulls out. In this case, a new pinion must be fitted to the pulley and the complete installation made. In either case, the work will not be found difficult. Then drill the pulley hub to match the holes in the fan and bolt the latter to it, as shown. Twist or arrange the vanes to blow air away from the motor when the pulley is revolving in its proper direction.

Plug the inlet and outlet pipes of the radiator so no leaks can occur and then drill and tap the pipes in suitable places for two ½-in. nipples. Spike blocks to the floor in front of the fan and mount the radiator on them with lag bolts. Then make a long tie-rod, to secure the top of the radiator to the face planks in a solid manner. The hose connections are then made to the two nipples on the radiator as follows: Tap the water-intake opening at the bottom of the shaft housing and insert a short piece of pipe or a nipple, and do the same to the outlet opening at the cylinder water jacket. Then clamp a hose from the inlet to the bottom of the radiator and from the outlet to the top of the radiator. This completes the circulatory system. The revolving fan blows air through the radiator and prevents the water from becoming overheated as it is pumped around through the engine, pipes and water jacket.

Belt up the pulley to the machines, fill the radiator with water, the gasoline tank with fuel, and you will be ready to run the plant. Crank it just as if it was on a boat, and regulate the speed by the usual spark and throttle controls. See that the running parts are well oiled, and this little outfit will be found to do good work. Of course, a small pulley belted to a large one on the machine will allow the motor to run at near normal speed and develop its maximum power.

If such an outfit is used in a shop with doors and windows open, the exhaust gases will not be noticeable. If the room is tight, on account of the weather, the gases should, by all means, be carried off. This can be easily done by the placing of a tin funnel over the muffler opening and

connecting it to a line of common rain pipe 2 in. in diameter, and leading it outdoors through a window or the chimney.

Comb for the Shop-Sweeping Brush

One of the minor annoyances of machine-shop life is the way steel cuttings stick in the brush when the floor is swept. A nail or a piece of wire is often used to clean the brush, but this takes so much time that we decided to make up a regular comb for the purpose, and this is shown in the accompanying drawing. Two end-pieces, sharpened at one end, are attached to the brush loosely with screws. These two pieces hold a rod, drilled with a row of holes to take short pointed wires, which form the teeth of the comb. The pieces should be securely soldered or welded together. Have the comb laid back on the handle when the brush is in use. When the cuttings have been swept into a pile ready for removal, the brush is cleaned by turning it over to allow the comb to fall down, so that the pointed ends can be dug in the floor and the brush rocked back and forth. This causes the comb to pass

Comb Attached to Brush Cleans It of Metal Cuttings

through the brush and clean it thoroughly of all sweepings that may have stuck in it. —Harry Moore, Montreal, Can.

Handy Drill-Press Accessory

Adjustable Stand near Drill Press for Holding Long Work Reduces Labor

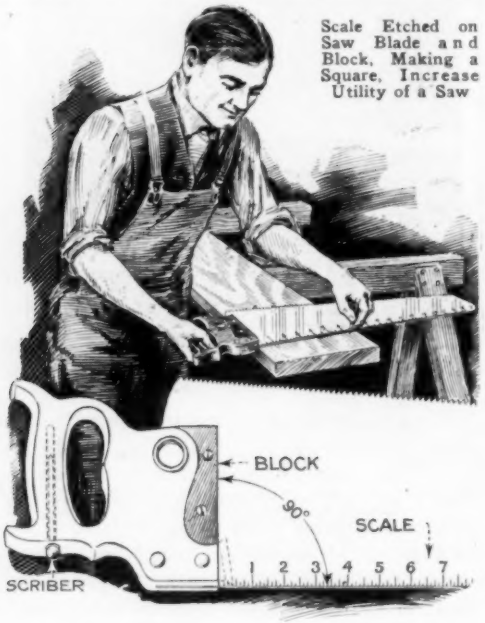
The adjustable steel horse shown in the photo has proved a valuable accessory to the drill press in a Denver steel shop, where it was originated to hold up the back end of long work being drilled. Two sections of ½ by 1½-in. steel bar, about 6 ft. long, are bent to form the ends of the frame, and two pieces of the same material, 16 in. long, are riveted across the end of these, to serve as braces. Four sections of the bar are also riveted lengthwise to the legs. The two uprights, which support the roller feeder, are perforated with numerous holes so that the top can be adjusted to any height desired by simply moving two cotter keys up or down. —Jos. C. Coule, Denver, Colo.

How You Can Guide Your Tractor with a Door Spring

When plowing with a tractor, where the one front wheel runs in the furrow, no guiding is necessary. But when the steering wheel is thrown partly around by the front wheels striking a depression or a bump on the surface, the former will not return to the straight-ahead position. To remedy this, a short leather strap, with a ring attached, was buckled around the rim of the wheel and a screen-door spring was attached to a point on the frame directly opposite to this ring. One end of the spring is snapped to the ring and each time the wheel is thrown either to the right or to the left, the spring returns it.

Increasing Usefulness of a Saw

The saw shown in the drawing should be used before its merit can be fully appreciated. It is a crosscut saw of the usual



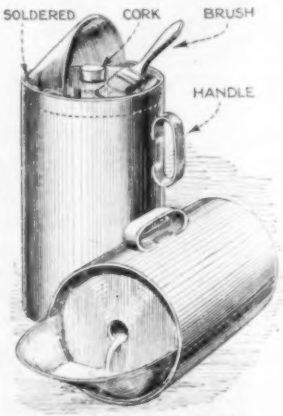
kind, but with the back edge ground straight, and the handle set so that its inner edge forms a right angle with the back of the saw. Instead of a new handle, filler pieces may be fitted to the original handle, as indicated by the shaded section in the sketch. Further convenience may be had by addition of a scriber and a brass tube for holding it in the handle, and by etching a scale on one side of the saw at the back. The saw can be used as a square, having double the range of the generally used universal square. It is much easier to handle than the large carpenters' square, and it saves one tool to carry around and look after when working on a staging.—Herbert A. Freeman, Willimantic, Conn.

Safety Rules for Working around Ammonia Pipes

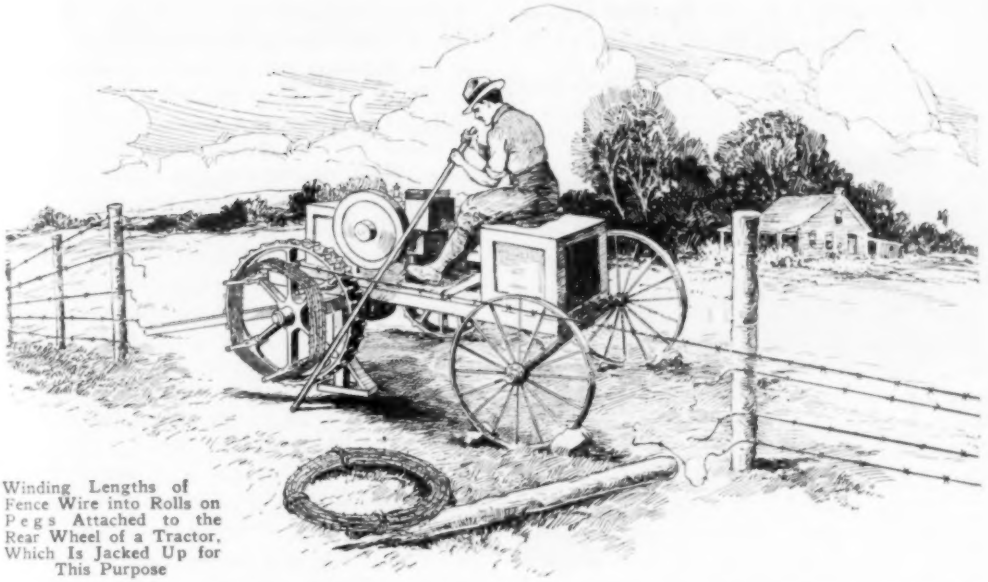
When opening a pipe joint where ammonia has been carried, care should be taken not to open the joint wide instantly. Fumes linger in such pipes in sufficient quantities to become dangerous when liberated in a room suddenly. Flanged joints should be loosened and very slightly opened by means of a thin wedge or screw jack and, if any fumes are detected, the joint should be closed immediately until they are drawn off or it may be left slightly open so that the fumes may pass off gradually. It is best not to loosen the bolts of a flange joint more than barely enough to separate the joint in case there might be pressure within the pipe, which would cause disaster if liberated suddenly. Screw joints should have the union slightly loosened and the joint broken loose before the union nut is entirely unscrewed. A towel saturated with vinegar held over the face should be used when loosening or working with ammonia-pipe joints especially in confined rooms.

Can Saves Varnish

A varnish can which preserves the contents, is used in a vehicle factory. It had been found wasteful to pour the varnish into small cans as it rapidly deteriorated if not used up within a short time, and as the cans must be carried around the factory some of the varnish was spilled. The special can shown in the illustration holds about 4 gal. of varnish and is made of fairly heavy metal. It is round in shape with a cover piece, soldered about 2 in. below the top, and a handle on the side. A cowl-shaped trough is soldered inside of the top of the can. A cork is fitted in a hole in the cover. When the varnish is required, remove the cork and tip the can until enough liquid flows into the cowl. The cork is replaced and the can placed upright so that the varnish floats on top of the cover. As soon as the work in hand is finished, the cork is removed to allow any unused varnish to run back into the can.



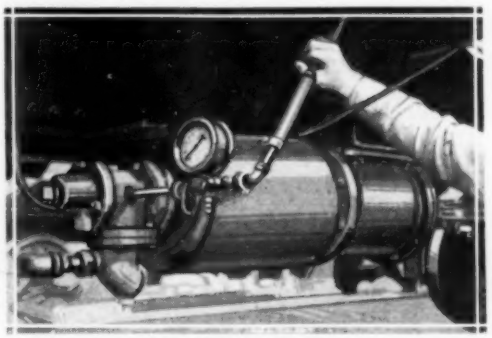
POSITION OF CAN WHEN POURING LIQUID



Winding Lengths of Fence Wire into Rolls on Pegs Attached to the Rear Wheel of a Tractor, Which Is Jacked Up for This Purpose

Tractor Used to Wind Up Fence Wire

I built the small farm tractor described in the August, 1917, issue of Popular Mechanics, and it has been of considerable use to me for several years. Last year I conceived an idea about a device on the tractor for winding up barbed wire. Winding it by hand is a mean job, but with the aid of this attachment the work can be done in a short time. To each spoke of one of the rear wheels a short length of iron rod is clamped to extend outward as shown in the drawing. In use, the tractor is set at one end of the fence and is jacked up. The wire is loosened from the posts and one end is attached to one of the winding pegs. The wheel is then revolved, which winds the wire around the pegs. You can wind a length of wire about a half mile long in this way. When the roll is completed, tie it up with short lengths of wire, loosen a few pegs and slip them toward the center of the wheel, which will permit you to remove the roll of wire. When using the tractor for this purpose, guide the wire with a 5 or 6-ft. length of iron pipe as indicated and keep one hand on the clutch at all times so that if the wire gets caught or tangled the winding can be stopped at once before the wire breaks or other damage is done.—Luther Strosnider, Onaga, Kans.



Method of Testing Air Cylinder and Retainer on Railway Car

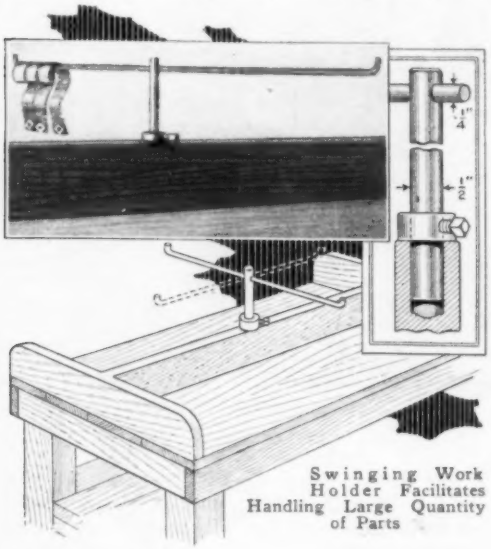
Saving Time in Testing Air

The time required to test the air on railway cars has been shortened by a method devised by an employe of a western road. He attached a short length of hose to the tester, mounted as usual on the triple-valve exhaust port, and connected the other end of the hose to the retainer pipe. By the use of a small petcock between the hose and air gauge both cylinder and retainer may be tested without the necessity of moving the gauge.

¶ To prevent chickens from catching cold, put some spirits of camphor in their drinking water, 10 drops to each quart of water, about once a week.

Two-Man Jobs Are Speeded Up by Swiveling Work Holder

Many shop operations could be finished more easily and quickly with the help of



Swinging Work Holder Facilitates Handling Large Quantity of Parts

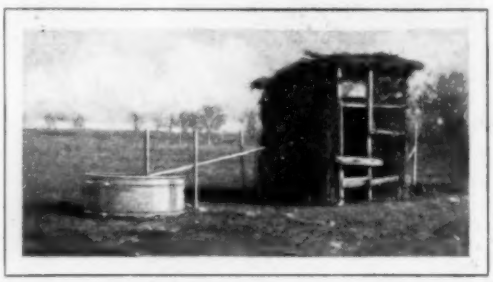
a holder similar to the one shown in the illustration. It is used in connection with a job of brazing nuts on the ends of flat-spring hooks. Removing the surplus metal and retapping the hole are the next operations. These are done on the same bench at the opposite side. The holder is used to facilitate the passing of the work from one operator to the other. The center board is drilled with a ½-in. hole to a depth of about 6 in., to take a piece of steel the same diameter, this piece being drilled through near the top to take a rail made of ¼-in. rod, which is driven tightly into the swivel post and then turned up slightly at each end. A collar with a set-screw is fitted to the post and, when assembled, it rests on a couple of washers placed on top of the board, to protect it from wear as the holder is turned. The method of using the holder is as follows: The operator engaged in brazing the nuts hangs each piece when finished on the part of the rail at his side of the bench; the first being placed at the extreme end, as shown in the photo, so that by the time this side of the rail is full, the end pieces are cool enough to be handled by the operator on the opposite side. Both operations consume about the same time; by the time one side of the rail is filled, the other is empty and all the second operator need do to get another batch is to swing the holder around a half turn when the empty rail is again presented to the first operator ready for filling. It has been found that by working this way there is no possibility of mixing up the work as often happened before. When the holder is not required, the post is lowered and the rail laid parallel with the center board out of the way.

Acid Test for Oil

The presence of acid in lubricating oils is detrimental and the following simple test to discover it is recommended. Dip blue litmus paper in the oil, and if the color changes to red, there is acid present. The litmus paper should be soaked in rain water before the test, for if the water happens to be alkaline, it will neutralize the acid absorbed by the paper and the oil will show a neutral condition when it really contains considerable acid.

Winter Shelter for Pump and Engine

The farmer who finds difficulty in keeping his pasture engine and pump protected against severe cold, will find the idea illustrated in the photo serviceable. The shed used to protect the pump consists of a framework inclosed and roofed with corn stalks, bound together in bundles and held in place with a wire both inside and outside. With the wind thus kept out, the interior will get quite warm when the engine is running, thus making for more efficient operation.—Dale R. Van Horn, Walton, Nebraska.



Corn-Stalk Shed Shelters Pasture Pump and Engine during Cold Weather

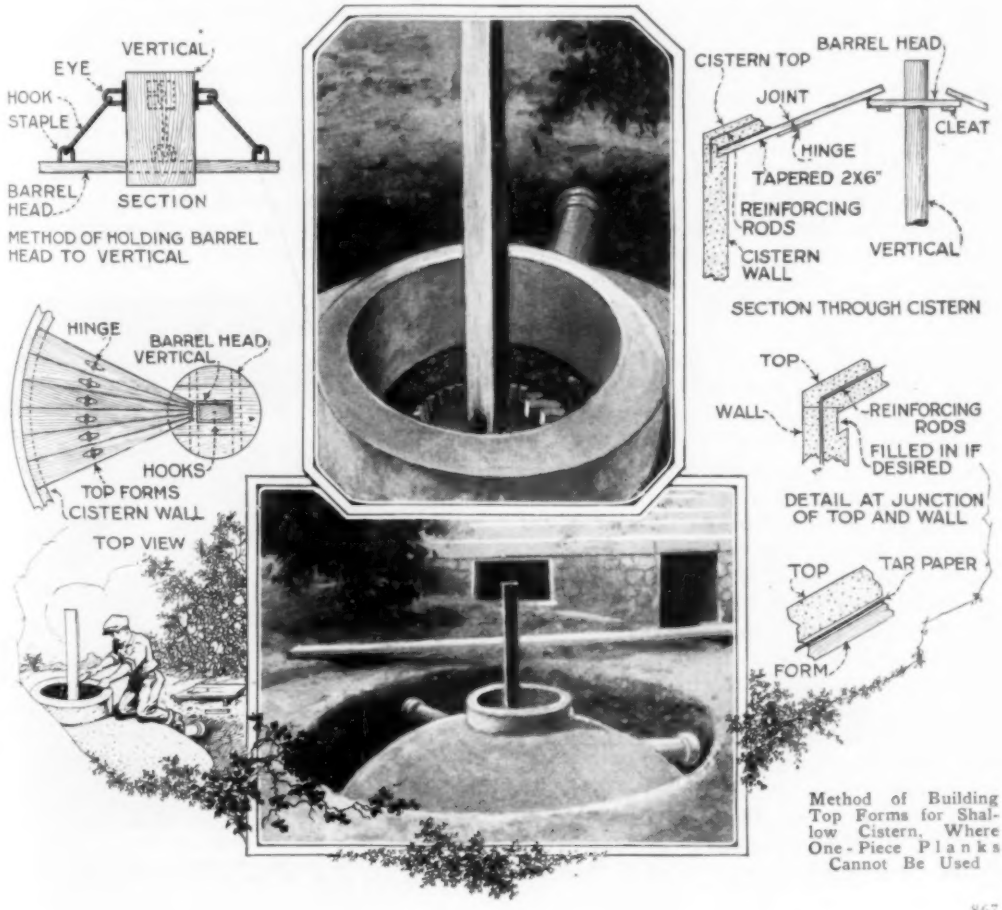
How to Build the Form Work for a Concrete Cistern

By ROY M. SINGER

THERE are many localities where it is necessary to store water. Generally some arrangement is used whereby rain water falling on the roof of a house is let into a cistern and pumped from the cistern as it is needed. The cistern may be made either of wood, steel, or concrete. Concrete cisterns are meeting with a good deal of favor because of the fact that the materials are to be had in practically every locality and because nearly anyone can build them.

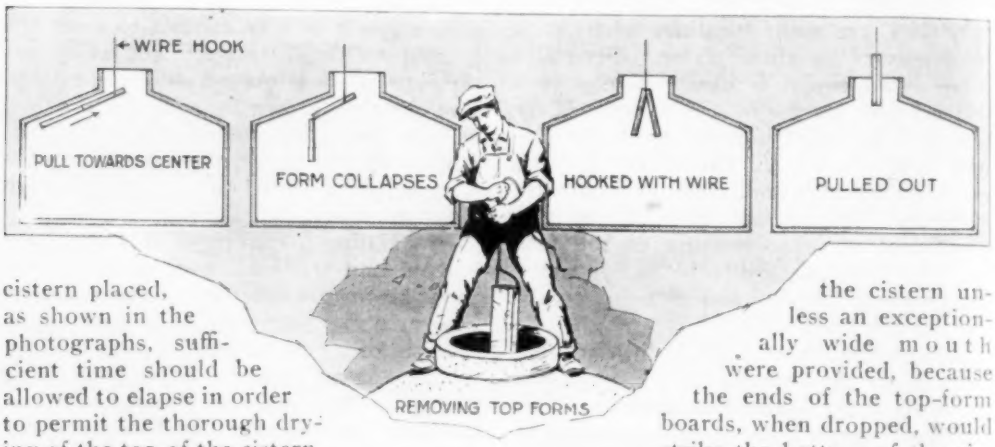
Where deep cisterns are built, the form work is simple, because such cisterns are generally built with wide mouths. For shallow cisterns, however, the situation is different. It is easy enough to erect the forms for a shallow cistern, but taking out the form work is quite a different matter. The sketches shown here illustrate a type of form work designed especially for shallow cisterns with narrow mouths, and it is especially adapted to withdrawal from a narrow space.

In building a cistern of this type, the bottom and walls are put in place first, then the form work for the top is set, as shown in the sketches. The form work consists of a central post to which a barrel head is attached by hooks; spanning the space between the cistern wall and the barrel head are set 2 by 6-in. pieces cut



Method of Building Top Forms for Shallow Cistern, Where One-Piece Planks Cannot Be Used

tapered to fill the circle. These pieces are hinged in the center and it is the hinges that permit the easy withdrawal of the form from the cistern. After the form work has been set up and the top of the cistern placed, as shown in the photographs, sufficient time should be allowed to elapse in order to permit the thorough drying of the top of the cistern. The form should be left in place for at least ten days.



When it becomes time to remove the forms, a wire is attached to the barrel head and the hooks holding the barrel head to the post are loosened. The barrel head is then allowed to slide down on the post until it falls free of the tapered pieces. It will be found that the 2 by 6-in. lengths will stick to the top of the cistern, due to the fact that they are held in place by the notch at the cistern wall and by the adhesion between the underside of the top of the cistern and the wood form. This adhesion may be overcome by placing tar paper upon the form before the top is poured; thus there will be a layer of tar paper between the form and the top of the cistern and the form will not stick.

Now attach a wire to one of the tapered pieces so that it can fall into the cistern, then work it out of the notch in the cistern wall by jiggling it back and forth. It may then be pulled toward the opening. The manner of removing it is best illustrated by the detail drawing. It will be seen here, that as the piece is pulled toward the opening, it collapses at the joint, and the wire may then be pushed farther along until the joint is reached, whereupon the form may be removed. After all the top forms have been taken out, the barrel may be pulled up (be sure that the mouth of the cistern is wider than the barrel) and removed from the cistern, the post then withdrawn, and the job is done. Where a shallow cistern is built it would be impossible to withdraw the forms from the cistern unless an exceptionally wide mouth were provided, because the ends of the top-form boards, when dropped, would strike the bottom of the cistern before the upper ends could be passed through the top opening. This method of hinging overcomes the difficulty.

Time-Saving Device Administers Capsules to Poultry

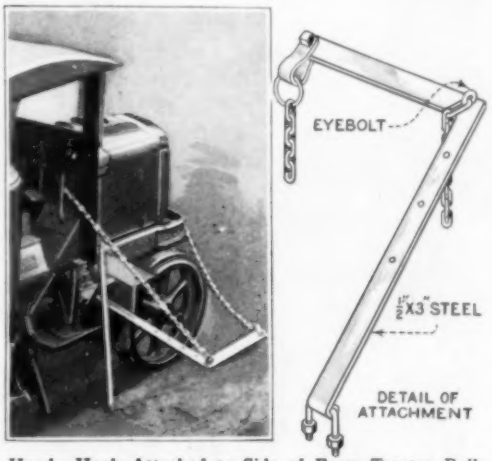
Every poultry raiser finds it necessary at times to treat his stock for worms. The usual remedy is nicotine sulphate in 2-gr.

Improvised Injector for Administering Capsules to Poultry Does the Work in a Short Time

capsules and the usual method of administering the capsule is to insert it into the bird's beak and then work it down with the fingers. Frequently the operation is not successful and the bird ejects the capsule to be picked up by another already treated and then the result is at least one dead bird. To avoid such accidents and to make the operation quick and easy, a California poultryman has improvised an instrument, with which a hundred or more birds may be treated in the same time as five by the old method. The instrument is a slightly curved hard-rubber tube, or nozzle, about 5 in. long. Cut into the end of the tube so it will fit over a No. 2 capsule. A wire injector fitting the top of the hole for the capsule is placed in the tube. The top of the wire is attached to a button, while a spring is provided around the wire. Press the button to move the injector and release the capsule. Release the pressure on the button and the spring around the wire will pull the injector back into place. To use the instrument the capsule is put in place, the tube is inserted through the open beak of the bird, the injector is pressed out and the tube is then withdrawn. The operation requires about five seconds, while, without the device, it sometimes takes five minutes.—Geo. B. Bowers, San Diego, Calif.

Side Hitch for Motor Truck

There are many other than just hauling jobs that the truck will perform when equipped with devices adapting it to these jobs. The drawing and photo show how a side hitch can be attached to a truck. It can be used, without damage to the truck, for jobs that do not require too heavy strain, such as stretching fence wires where the line of posts prevents a direct pull from the rear end of the truck; pulling a plow along a bank, ditch or gulley, when filling these openings; pulling a road blade to trim off the side of the graded road, etc. The pieces required and their forms are shown in the drawing. The pulling bar is made of a piece of ½ by 3-in. machine steel, forged with the eye at the inner end around a U-bolt. The bolt passes through the side of the frame of the truck with two nuts on the inner side. A right-angle bend is given the pulling bar to allow the front wheel to clear both the bar and the chain, which connects it to the front end of the truck

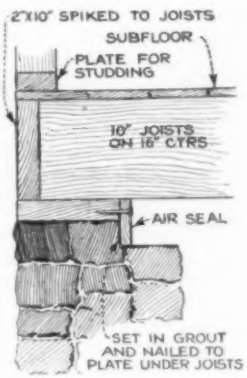


Handy Hook Attached to Side of Farm Tractor Pulls Light Implements

frame. The chain, attached to the dash and bar by means of the eyebolt, allows adjustment for height such as the tool being pulled, or as the work may require. It also allows the bar to be folded and hooked in a vertical position when not in use.—G. G. McVicker, North Bend, Nebr.

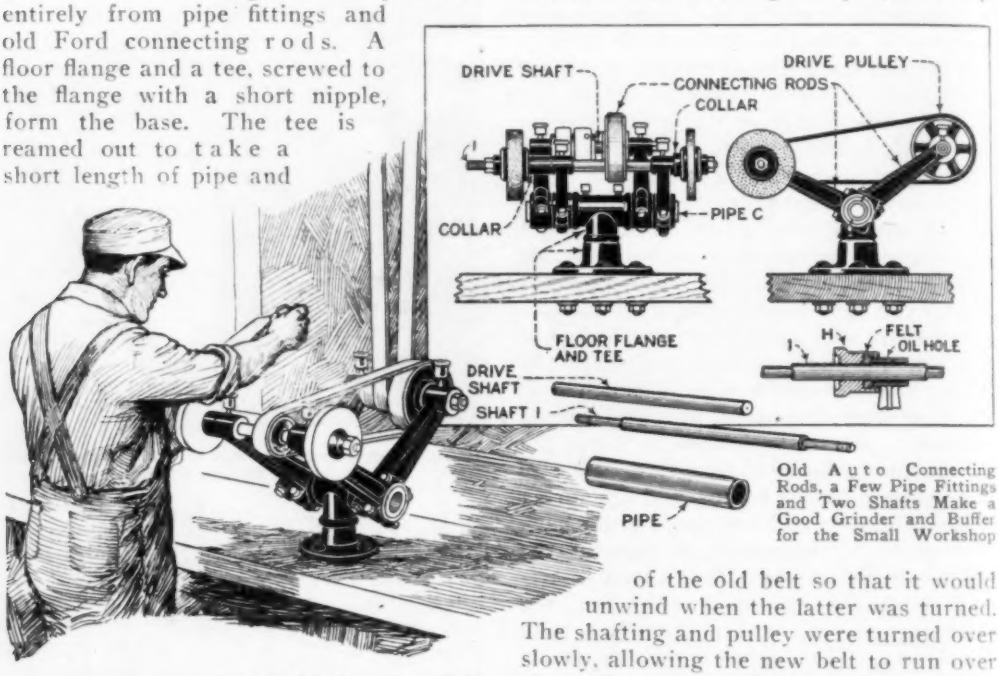
Eliminating Air Leaks in Stone Foundations

It is rather difficult to make a really air-tight job at the top of stone foundations. The heat loss caused by such leakage is considerable and causes cold floors in spite of all that is done to prevent it. A good method of preventing this trouble is shown in the accompanying illustration. A 2-in. board is nailed to the plate, as indicated, the top of the foundation having been cut back to permit this. The sealing board is set in grout, and after it is in place one or two coats of paint should be applied, as this will help to close all small cracks.


2"X10" SPIKED TO JOISTS
SUBFLOOR
PLATE FOR STUDDING
10" JOISTS ON 16" CTRS
AIR SEAL
SET IN GROUT AND NAILED TO PLATE UNDER JOISTS

A Serviceable Homemade Grinder

As can be seen, the grinder and buffer shown in the drawing is built up almost entirely from pipe fittings and old Ford connecting rods. A floor flange and a tee, screwed to the flange with a short nipple, form the base. The tee is reamed out to take a short length of pipe and



Old Auto Connecting Rods, a Few Pipe Fittings and Two Shafts Make a Good Grinder and Buffer for the Small Workshop

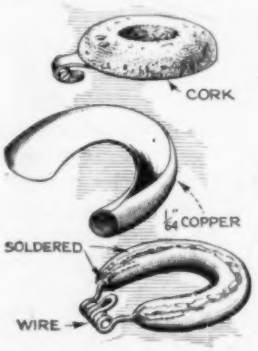
setscrews are used to hold the pipe C in place, on which four connecting rods are fitted to hold the grinder arbor and the driveshaft. The lower bearing surfaces of the connecting rods are screwed up tight on the pipe C, to make the arbor and driveshaft parallel. The upper bearings are fitted with grease cups. The driveshaft is provided with tight and loose pulleys and also a drive pulley. Another pulley is fitted on the arbor in line with the drive pulley, and also two collars having an overhang to inclose felt dust washers, which are placed as shown in the detail. The arbor shaft I is turned down for the grinder and buffer, and the ends are threaded for nuts with which the wheels are held on the shaft securely.—Geo. H. Cappel, Wilmer, Ala.

Installing New Belt in Factory

In a factory where I was doing a small job, a long and heavy leather belt, about 18 in. wide, was being installed. The method used to get the belt in position was novel to me as it removed most of the difficulty usually encountered when doing such a job. Both ends were cut square and one end was fastened to the old belt. The roll of new belting was placed on top of the old belt so that it would unwind when the latter was turned. The shafting and pulley were turned over slowly, allowing the new belt to run over the pulley on top of the old belt. When the new belt was run out, the clamps were put on, the rods tightened and the old belt cut off, leaving the new one in place with a perfectly tight joint, ready for the joint fasteners.—J. E. Noble, Toronto, Can.

Metal Float for Special Fuels

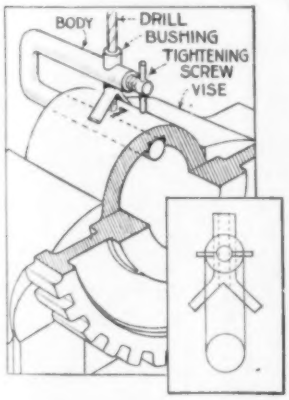
Special fuels for automobile use are frequently compounded with benzol. The benzol dissolves the shellac from the cork float of the carburetor and the cork becomes saturated. A clogged float and a constantly dripping carburetor are evidence of this condition. Loss of gasoline is expensive and also a possible source of fire. To prevent this trouble a metal float should be used in the carbu-



retor. The method of making this float is shown in the drawing. The copper used should be approximately 1/64 in. thick; this is cut semicircularly and formed around a bent rod, working from one end around the circle. The ends are brought together and the seams held by overlapping and soldering them. The hinge is also soldered to the float. After completion of the float it is a simple matter to bend the wire until the gas reaches the proper level.

Jig for Center-Drilling Keyways

Many machine parts, like gears, cams, sleeves, etc., are held to shafts by means of setscrews bearing on the key itself. In such cases it is imperative that the tapped hole is central with the keyway, or else part of the locking effect is lost. We use a very simple jig for this work. It consists of three parts; the body, a bushing and a screw. The body is made of ¾-in. round stock, bent as shown; the bushing is ½ in. in diameter and is sawed up the center and spread out to form a V-shape. The jig is slid into the keyway and the bushing is pushed down to draw the body up in the keyway firmly; then the screw is tightened. Only one-size hole can be drilled, of course, but as this is always central, it can be enlarged with another drill to the size required. We hold such work in the vise and square it up with the side of the jig.



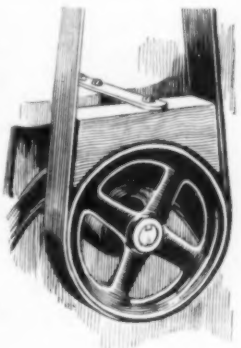
Take 8 oz. canvas and stretch it on a frame with galvanized tacks. After painting the underside and allowing it to dry, wet the upper side with water and then paint it while damp. This insures good waterproofing.

Lightening the Task of Handling a Heavy Air Hammer by Burlap Padding and Heavy Rubber Tube

Absorbing the Shock of an Air Hammer

Holding a heavy air hammer, driven by 40-lb. pressure, and cutting rivets with it all day is no light task for three men, yet there is a method of making the work easier than it would be with the naked hammer, as turned out by the manufacturer. To soften the jar and rub of the machine, it is wrapped thickly in burlap, while the wearisome jar of the butt, against the operator's body, is lessened by a 6-in. section of air hose, such as is used in coupling railroad cars, which is held by two small bolts through the hose and the butt of the hammer.—Jos. C. Coyle, Denver, Colo.

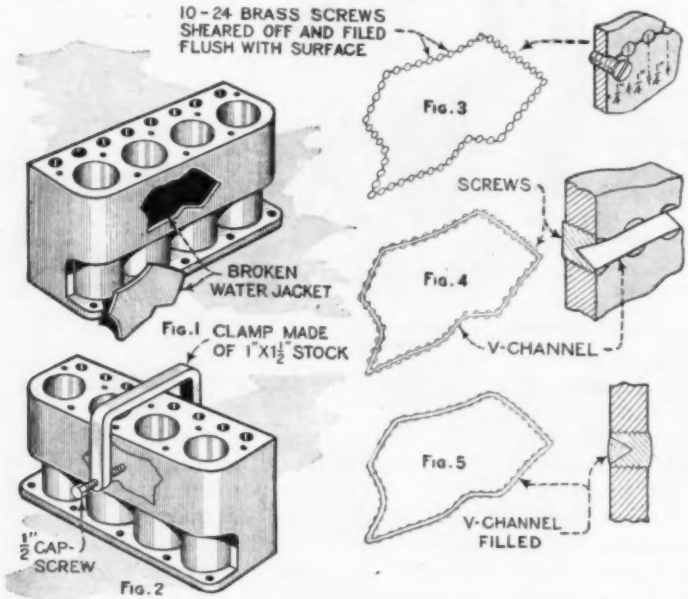
Pulley Guard Saves Hands



To prevent workers from getting clothing and hands between a pulley and the belt, the novel guard shown in the illustration has been found practical. It is a good precaution especially if the belts have to be thrown off frequently or the belt is used as a safety device and throws itself off when the machine is jammed.—Auguste Mathieu, Chicago, Ill.

Broken Water Jacket Repaired without Welding

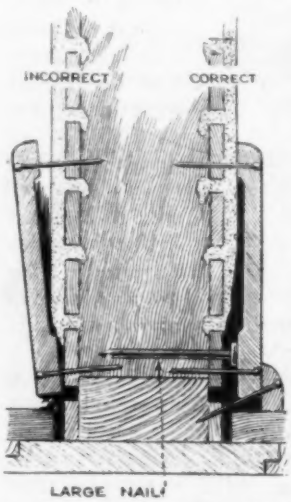
With the coming of an unexpected cold snap, many motorists discover a cracked water jacket. This usually means a new block or an acetylene weld, a costly job in either case. However, any external break can be permanently repaired by the following method. Fig. 1 shows a cylinder block with a section of the jacket broken out entirely. Fig. 2 shows the piece restored and held in place with a specially made, strong clamp. Around the entire crack, drill and tap holes about ¼ in. apart for 10-24 screws. Next tin a quantity of 10-24 brass screws and screw them in so they will be flush with the inside of the water jacket. Tinning the threads of the screws will prevent the possibility of a leak around the threads. Chisel off all the screws flush with the surface and remove the clamp. Now make a fairly deep V-channel with a diamond chisel along the entire line of the crack. If your motor has a removable cylinder block, place it in an oven or over a slow fire until pure lead just melts, or apply the flame of a blow-torch evenly around the casting until the metal sizzles under a wet finger. Then fill up the V-groove with half-and-half solder, using zinc chloride dissolved in distilled water as a flux. Use a hot iron and make sure that the entire surface of the "V" is tinned before filling it up flush with the surface of the jacket. Scrape away the surplus solder, file smooth and enamel, and you will have a permanent and invisible repair job. If welded, either electrically or with acetylene, the finished job would be lumpy. This method can also be used to repair an aluminum crankcase when a rod has gone through it, if you can recover the pieces. In the case of aluminum, make the screws from a piece of aluminum rod and finish the job with a good grade of aluminum solder.



Cracked Water Jacket on Automobile Repaired by Simple Method Using Screws and Solder

Proper Application of Baseboards

Defects in plastering are frequent, and when the plaster has been "dubbed off" a few inches above the floor, the carpenter has to adopt some means of holding the baseboard straight. A good method is shown in the illustration. A 16-penny spike is driven into the 2-in. plate on which the studdings are set, so that the head is flush with the surface of the plaster, as shown at the right in the drawing. The baseboard can then be nailed on, care being taken not to drive the spike in any farther. The incorrect method is shown at the left for comparison.—H. H. Siegele, Emporia, Kans.



You Can Do Hammered-Copper Work

By DICK HUTCHINSON

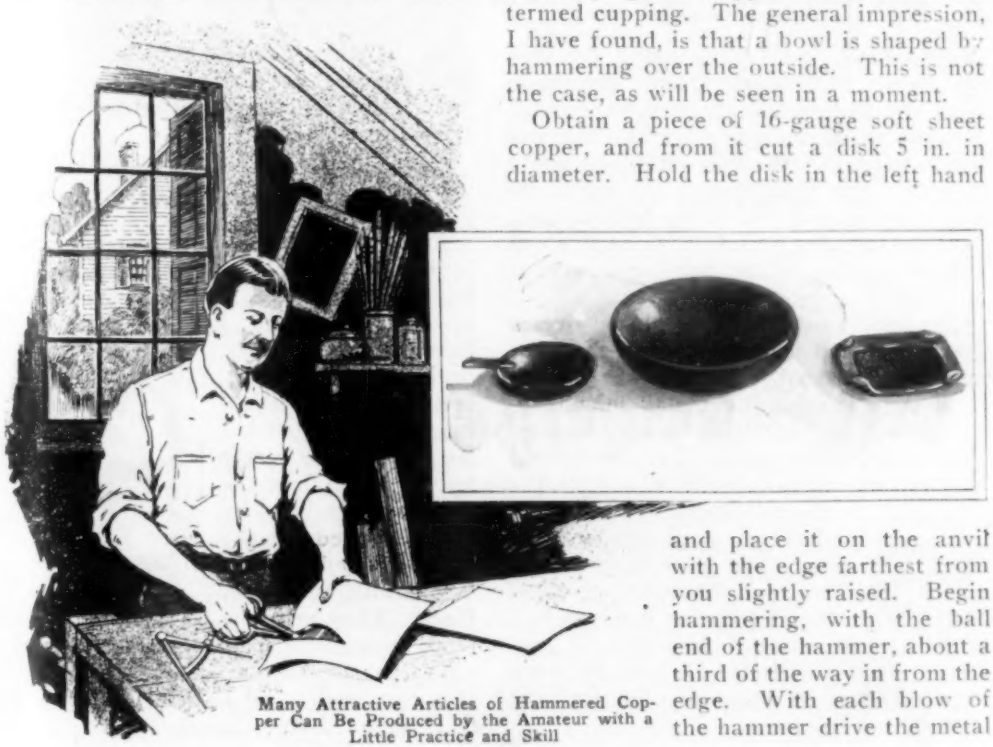
THERE are few amateur mechanics who have not at one time or another looked at a pretty piece of hammered-copper work, and wished that they could duplicate it. Not that the thing looked hard, but that it was apparent that there must be some "tricks of the trade" that were necessary to know before tackling the job. It is the purpose of this article, which is the first of several, to teach the amateur how to wield the ball-peen hammer in the most effective manner. Of course, the hammering of sheet copper into any desired shape requires skill, and this demands diligent practice and effort, but the actual fundamental operations are really simple enough.

While it is the general impression that a large assortment of expensive tools is required for this kind of work, such is not the case. The following tools will pretty thoroughly cover the requirements for any ordinary work, and might as well be acquired at once: A small anvil or a block of steel with a smooth and true surface, an 8-oz. ball-peen hammer, a small bench vise, a pair of tin snips, a good cold chisel, an assortment of punches (nail sets are best and cheapest) which can be ground to suit the work at hand, an assortment of small files, 10 cents' worth of liver of sulphur, a small bottle of transparent lacquer, a good camel's-hair brush and a few sheets of jewelers' emery or polishing paper from a supply house.

Before beginning work, lay a sheet of the emery paper over several thicknesses of blotting paper, emery side up, and proceed to polish both faces of the ball-peen hammer by rubbing back and forth over the emery. The blotters afford a cushion for the emery paper, and make a better surface on the hammer face. A good surface is necessary, since the smallest scratch on the faces will show on the finished piece of work.

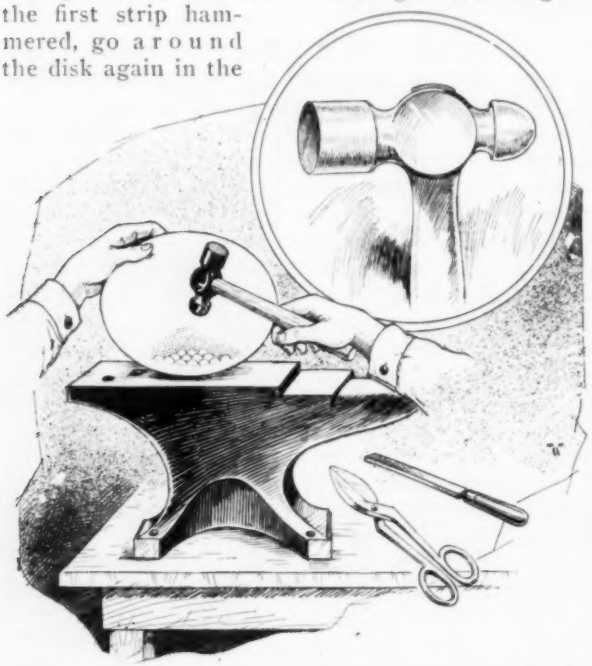
The first operation to be described is the shaping of a copper bowl, or what is termed cupping. The general impression, I have found, is that a bowl is shaped by hammering over the outside. This is not the case, as will be seen in a moment.

Obtain a piece of 16-gauge soft sheet copper, and from it cut a disk 5 in. in diameter. Hold the disk in the left hand and place it on the anvil with the edge farthest from you slightly raised. Begin hammering, with the ball end of the hammer, about a third of the way in from the edge. With each blow of the hammer drive the metal



Many Attractive Articles of Hammered Copper Can Be Produced by the Amateur with a Little Practice and Skill

toward the edge. Go completely around the disk in this manner, hammering over a strip about ½ in. wide. Starting inside the first strip hammered, go around the disk again in the same manner, and then, laying the disk flat on the anvil, circle around the inside until the center has all been hammered. Now tip the disk up on edge and hammer the part outside the first strip and up to the edge, this time driving the metal toward the center. Care must be taken not to strike the very outside edge, as this will expand the top of the bowl and make it lopsided.



The Type of Hammer Used, and the Method of Starting the Cupping of the Copper Disk

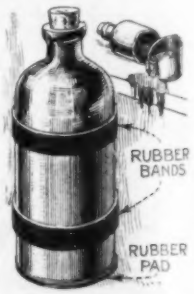
The bowl should now be placed over a fire and heated to a cherry-red, then immediately plunged into a pail of cold water. This anneals the metal, which becomes hard and brittle under the hammer. The piece is now ready for the second hammering, which is done in exactly the same way as before. Repeat the hammering several times, or until the bowl is about 1 in. deep. The piece must be annealed between each hammering. The bowl can be trued by placing it over a ball of the correct size, and hammering it very lightly on the outside. When the edge has been trued by means of a file the bowl is ready for coloring.

Dissolve about ¼ oz. of the liver of sulphur in a quart of water, and, after cleaning the metal thoroughly with soap and water, immerse the bowl in the solution and allow it to remain until the desired color is attained, then remove, wash under running water and allow it to dry. This solution will produce colors running from a reddish-brown to a deep blue, depending on the time the article is left immersed. Burnish the high lights (the raised portions) with a piece of fine jewelers' emery paper, polish with a piece of clean, soft rag; then, with the camel's-hair brush, spread a thin coat of lacquer over the entire surface, and the bowl is completed.

The ash trays shown in the accompanying photos are produced by this method, and a little experiment and practice will enable the amateur to turn out many original designs along this line. The beginner must not be discouraged if his first attempt does not look as good as the work of the professional. In this work, as in all where manual skill is necessary, patience and perseverance are essential. More elaborate pieces will be described in subsequent articles.

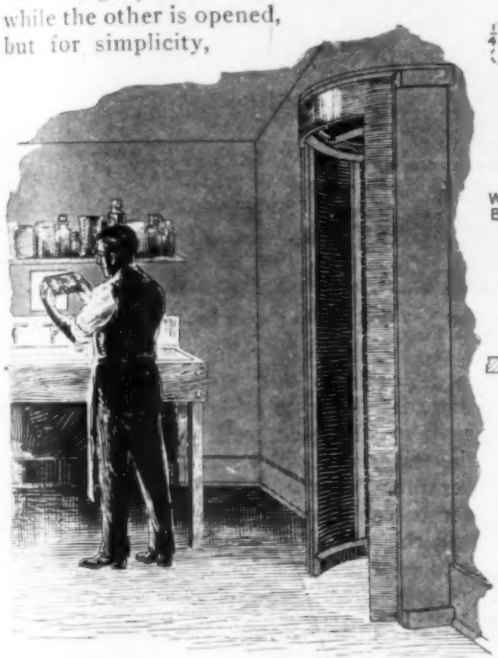
Bumpers for Bottles

For several years I have been annoyed by the occasional breakage of stain, shellac and acid bottles when handled by the boys in the shop. I have now solved the problem by cutting sections of old inner tubes to fit the bottles. Some of the larger bottles often had the bottoms cracked by being dropped into the cases or by being set down with too great force. They are now fitted with rubber pads, the same size and shape as the bottom of the bottle, and these are shellacked or cemented on.—A. S. Peterson, Lihue, Kauai, T. H.



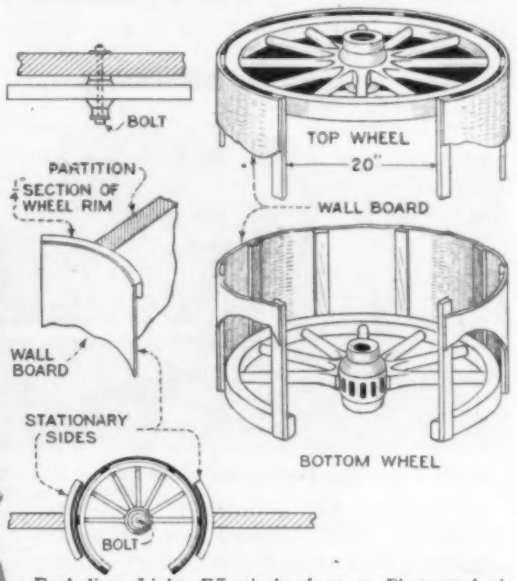
Light-Proof Door for Photographers

A door that really shuts out the light from one room to another is always sought by photographers, laboratory workers and others engaged in work where daylight is not desired. Most light-excluding doors depend upon interlocking systems that shut one door while the other is opened, but for simplicity,



the one shown in the drawing will be found highly satisfactory. Any man handy with tools can build it.

It is of the revolving type and is made by arranging light-excluding material on a frame built on two wheels. Its construction is as follows: Get two light wagon wheels of the same diameter, and a third wheel slightly larger, so that one of the smaller wheels will just turn clear inside of it. Arrange the door opening so that it is 1 in. wider than the diameter of the smaller wheel plus twice the thickness of the rim of the larger wheel. It is best to run it from floor to ceiling. If not, a ceiling will have to built above the door to shut out the light from the top. Remove the spokes and saw the large wheel in four equal parts. Nail one section to the door jamb at the top and the bottom on each side of the door and cover the inside surface with light wallboard. If the latter does not conform to the curve, it will be necessary to insert two or three upright strips vertically, mortising

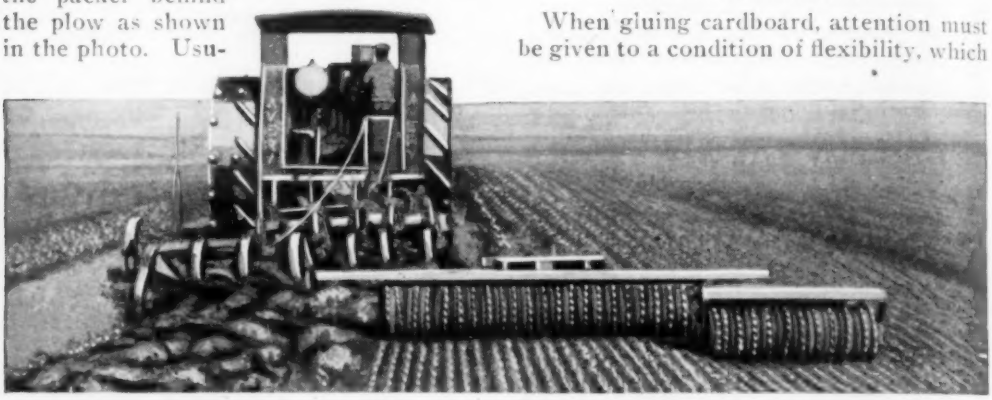


Excluding Light Effectively from a Photographer's Dark Room by Using a Revolving Door, Which Is Pivoted on Wagon Wheels

them into the concave surface of the rims. When covered, these walls will be at right angles to the wall of the room and somewhat concave. Start the door by pivoting one wheel to the ceiling with a heavy lag bolt and the other to the floor. They must be centered exactly between the side walls so that they will turn with equal clearance between the walls. Connect them with wooden uprights, 1 ft. apart and mortised into the rims. One upright is left out to provide the door opening. When the frame is completed and revolves evenly, cover it with wallboard, letting the edges come as close to the ceiling and the floor as practicable. Saw out the section of the rim, between the door-opening uprights, from the bottom wheel and remove half of the spokes. Cover the edges of the revolving door with felt weather strip. A strip of this, run vertically on each side of the door opening in the revolving section, will also help exclude the light as the door revolves. The door is operated by turning the cylinder until the opening shows, then step in and push the door around. Painting the interior or the sidewalls and the revolving section black will also help to eliminate the light.

Attaching Packer to Tractor When Plowing

When plowing the stubble ground for fall wheat, time can be saved by attaching the packer behind the plow as shown in the photo. Usually a side draft is caused by hitching another implement to the side of the tractor, especially with a two-plow outfit. However, with a three-plow outfit, or a larger one, the side draft may be largely equalized by running the tractor closer to the furrow, or even in the furrow. The two right wheels may be operated in the furrow and the plow hitch set over so that the proper draft line is obtained. A timber of 2 by 8-in. oak is attached rigidly to the frame or drawbar of the tractor, and is allowed to extend over to the plowed side some 5 or 6 ft. outside of the drive-wheel. The outer end is attached to a point near the front of the tractor frame with a chain, or cable, so that the draft will not come on the attaching bolts at the rear. The packer is equipped with an extension tongue, and it is better to have a front truck. This extension tongue allows the packer to follow behind the plow and to one side. Various holes in the draft timber will allow the hitch of the packer to be made so that it will not interfere with the plow when turning corners. The greatest draft is needed for the plow, and thus, to equalize the side draft, the plow has to be hitched over to the left of the center much less than the packer is hitched to the right. The more plows the tractor operates, the farther over the timber draft bar should extend, and thus the more packers can be attached. The whole attachment may be constructed at home with a few simple tools.



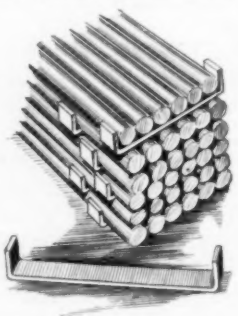
Saving Time When Plowing Stubble Ground for Fall Wheat by Attaching the Packer behind the Plow, Both Being Drawn by a Tractor

Glue for Cardboard

When gluing cardboard, attention must be given to a condition of flexibility, which is desirable in this work. To any quantity of flake glue add sufficient water to soak up the glue well, pour off some of the water and add a small quantity of turpentine. Then add 2 parts of starch powder to each part of flake glue by weight, mix the whole to a thick mass and allow it to cool before using.

Piling Round Bar Stock

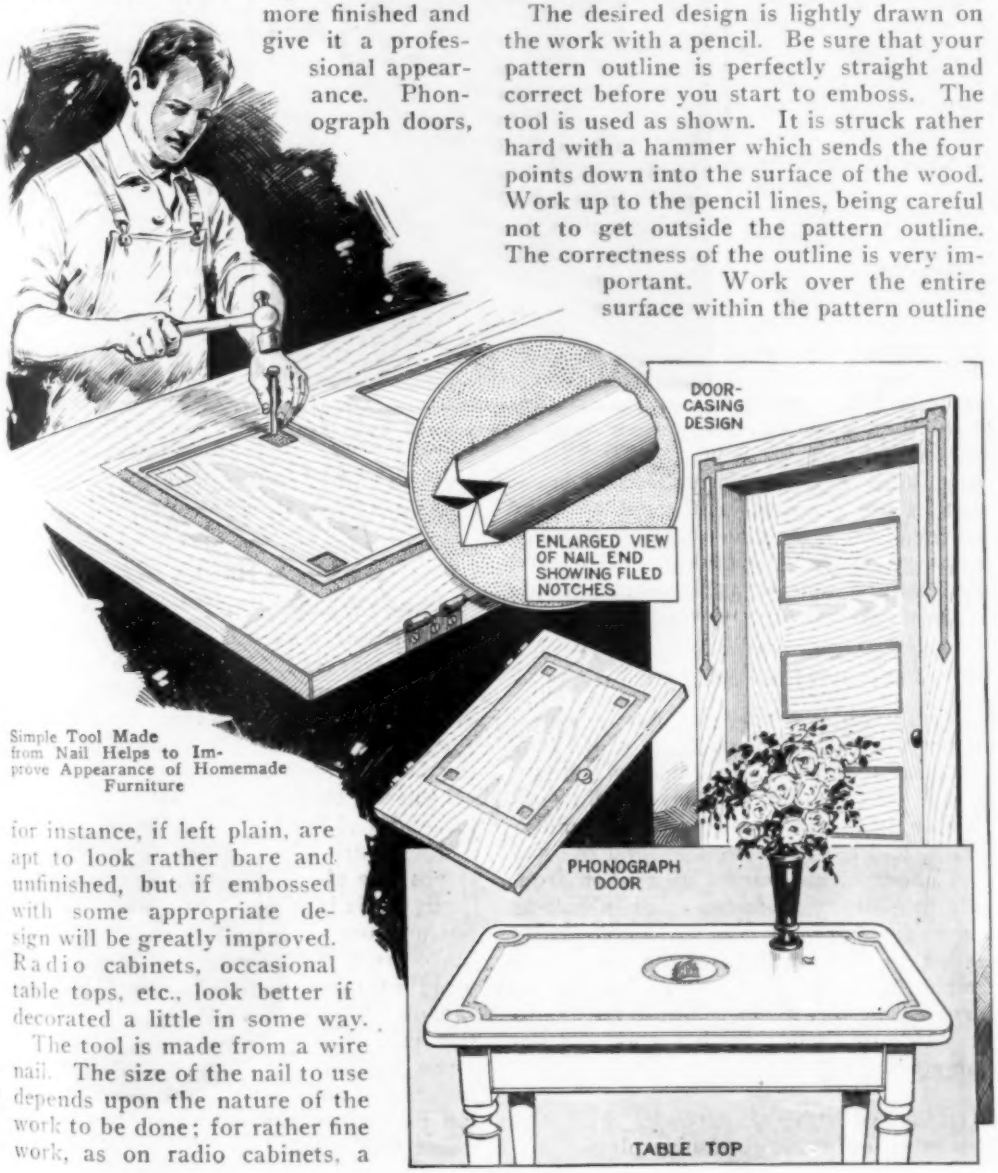
Many serious accidents have occurred by piling round shafting carelessly. The usual practice is to lay sticks between each tier and wedge the outside lengths to prevent rolling. The wedges often become loose when removing a length of shaft and allow the whole pile to start rolling. The system of piling shown in the accompanying illustration will prevent the heaviest shafting from rolling and is simple and cheap. Cross-pieces of flat stock are bent as shown and used between successive tiers, three to four for each tier, depending on the length. The piles are arranged according to sizes and may be safely run up very high.



Embossing Wood Is Simple Operation

By HAROLD JACKSON

THE accompanying illustrations show how to make and use a simple little tool with which you can emboss very beautiful and attractive designs on furniture you are making or on any woodwork that you may happen to be doing. A design or border of some kind worked out with this tool will make your work look more finished and give it a professional appearance. Phonograph doors, for instance, if left plain, are apt to look rather bare and unfinished, but if embossed with some appropriate design will be greatly improved. Radio cabinets, occasional table tops, etc., look better if decorated a little in some way.



Simple Tool Made from Nail Helps to Improve Appearance of Homemade Furniture

The tool is made from a wire nail. The size of the nail to use depends upon the nature of the work to be done; for rather fine work, as on radio cabinets, a six-penny nail should be used. On coarser, a sixteen or twenty-penny spike is best.

Cut the point off the nail and file two grooves in the end of the nail at right angles to each other. Use a three-cornered saw file to make these grooves. This will make four points on the nail as shown in the insert.

The desired design is lightly drawn on the work with a pencil. Be sure that your pattern outline is perfectly straight and correct before you start to emboss. The tool is used as shown. It is struck rather hard with a hammer which sends the four points down into the surface of the wood. Work up to the pencil lines, being careful not to get outside the pattern outline. The correctness of the outline is very important. Work over the entire surface within the pattern outline

in this way. Then brush the work with a stiff brush to remove any loose pieces of wood that there may be.

The embossing should be done while the wood is in the white, before any stain or varnish has been applied. Due to its roughness, the embossed parts will finish a little darker than the rest of the surface, and this gives a good contrast. It is a good idea to practice on a piece of scrap board before you start on an important job. Like everything else, a little practice will teach a great deal more than a whole lot of printed instructions. The tool is really an adaptation of the "ground" tool used by wood carvers, but, while wood carving demands a lot of practice and skill, really good work can be done with this simple method without any previous experience.

Shop Worker Reduces Fatigue and Saves Time by Using Mirror behind Dado Machine

Mirror Helps Do Dado Work

In a woodworking plant at Wahoo, Nebr., one of the workmen has installed a small mirror on the dado machine so that, by looking into the mirror, he can tell where to strike the wood with the power-driven bit. In the photo the workman is cutting mortise-and-tenon joints in the frame for a screendoor. He claims that the mirror not only saves one-third of the time but also prevents fatigue of the neck and shoulder muscles. The device has been in use for three years and all who have worked with it have found it satisfactory. —Dale R. Van Horn, Walton, Nebr.

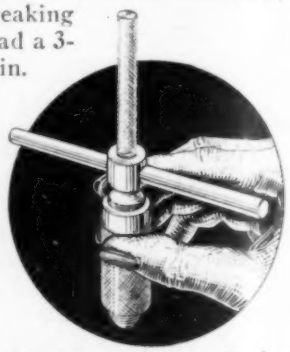
Handy Milk-Bottle Carrier

A milk-bottle carrier for barn or emergency use can be made from a old barrel head and some tin cans. Cleat the barrel head so that it forms a solid disk. Then turn it over, with the cleats underneath, nail a barrel hoop around the rim and about three-fourths of a hoop from side to side for a handle. Cut in half as many tin cans as can be conveniently nailed to the surface of the tray to a height of about 3 in. They should be large enough to allow the milk bottles to fit inside of them. Such a tray will accommodate about ten bottles.

¶Discarded straight petcocks with the key removed make good pipe plugs.

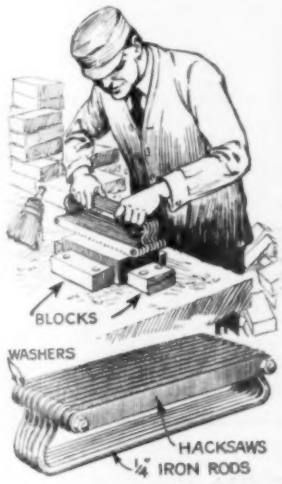
Extension Handle on Tap

After tapping a hole, it usually takes considerable time to screw the tap out, and the worker is likely to do this in haste and become more or less careless, which may result in a broken tap. To speed up the removal and at the same time lessen the danger of breaking off the tap, thread a 3-in. length of ¼-in. rod. Knurl it if possible although this is not necessary, and screw it into the tap, as shown. After the hole has been tapped, unscrew the tap by rolling the extension handle between the palms.



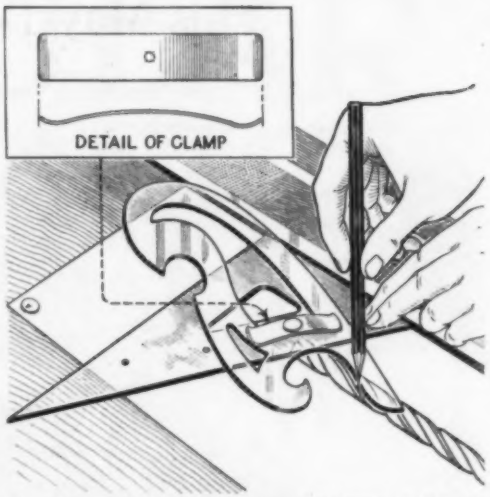
Brick Cleaner from Hacksaw Blades

For cleaning the face of brick or removing paint and plaster, an excellent tool can be made from a dozen or more old hacksaw blades, mounted so that they will be spaced about ¼ in. apart, and provided with handles, as shown in the drawing. To bind the blades together, washers are placed between the ends and long threaded rods, with a nut at each end, are used to form them into a solid bundle. The handles are made up of equal lengths of ¼-in. rod, with the ends flattened, drilled and bent to the shape shown. Any brick can readily be cleaned on the face surface with this tool so that it has the appearance of being new when set into a finished wall. To hold the brick, four blocks of wood are nailed to a bench and spaced to accommodate the brick. The cleaner is rasped firmly across the face, making a clean job of resurfacing in a very few strokes.—G. A. Luers, Washington, D. C.



Rubbing Down Varnish

In doing some cabinetwork, I discovered a method of saving a lot of hard work and time when rubbing down the varnish with pumice stone. I have always had a great deal of trouble to get the finely powdered stone removed from the small interstices of the wood before applying the second coat and again later on. On the last job I did, that of making a library table of black walnut, I mixed a small amount of the powdered pumice with some walnut stain. The result was highly satisfactory. The object of mixing the pumice with the stain was to fix it so that if any small amount were left in the work it would be inconspicuous.—H. F. O'Neal, Noblesville, Ind.

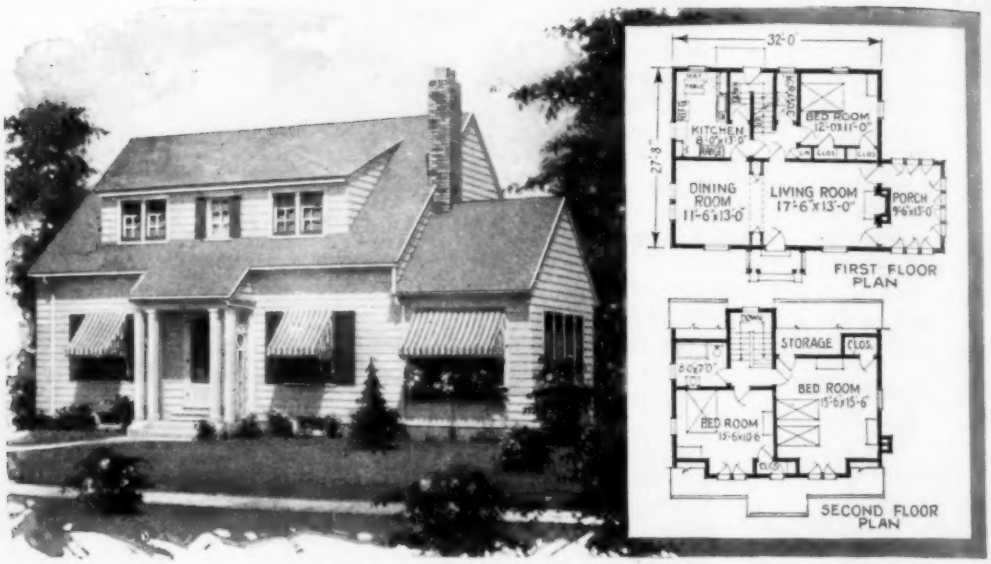


Clamping a French Curve to a Triangle Makes It Easy to Handle

Clamp on Triangle Holds French Curve

Many an exasperating job of irregular-curve drawing can be made just as easy as the use of a triangle. A small sheet-metal clamp grips and holds the curve securely in any position by means of a thumbscrew set in one of several threaded holes in a regular triangle, and permits it to be moved along in any direction, while it is kept in perfect alinement. The same curve section can be repeated any number of times at any desired intervals and with the assurance of getting it correctly located every time. A medium-size triangle will be found preferable to serve as a base for the clamp. No tap is necessary in making the holes, as a sharp screw will cut its own thread in celluloid. Care must be taken, however, not to make the blank holes too large. They should be slightly larger than the bottom diameter of the thread. The clamp is made of 1/32-in. spring brass or bronze, and should be slightly bent up at the ends and sprung up in the center, as indicated. All the corners should be rounded. The thumbscrew should not be too large and must have a small stem with a fine thread similar to screws in drawing instruments. In the illustration, the arrangement is shown in laying out the flutes of a twist drill, which can be accurately done in a short time, a guide line being drawn to one side of the triangle to preserve the vertical alinement.—H. Simon, Santa Ana, Calif.

This May Be Your Home



Copyright, Architects' Small House Service Bureau

Plan No. 6A48

QUESTIONS regarding home building addressed to this magazine will be answered by The Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and endorsed by the United States department of commerce. Inclose 10c and self-addressed envelope. Blueprints, specifications and material list for the house shown here may be obtained at nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired, send 5c and stamped envelope for a 24-page booklet explaining how the Small House Service Bureau functions and showing 12 sample plans. A new booklet, entitled "Fifty Ways to Lower Home Building Costs," illustrated by ten bureau houses actually lived in, and showing how as much as $1,000 can be saved on a home, may be obtained for 20 cents.

THIS six-room Dutch colonial home, of frame construction, combines excellence of plan, economy of construction and beauty of design. It is suitable for almost every locality. It can be built on a fifty-foot lot, and by omitting the sun porch, a forty-foot lot will do.

The interior is a fine example of skillful planning. Very important are living and dining rooms of any home. These rooms concern the comfort of the entire family. In this home these are two fine, big rooms separated by an arched opening with bookcases at either side. This makes them practically one big room. The open fire is so placed that its cheerful blaze and warmth on a chill early autumn or spring day can be enjoyed by both rooms. A French door at either side of the fireplace leads to the sunroom.

The first-floor bedroom and lavatory is a special feature. This room has two good clothes closets and there is a linen closet in the hall.

The position of the stairs gives them great privacy, which is most unusual in a small home.

On the second floor there are two bedrooms. One is fifteen feet six inches square and has wall space for twin beds. It also has a clothes closet and roomy storage space under the eaves large enough to contain several trunks.

In the kitchen there is a chance for a breakfast nook to be built into one corner, as shown on the first-floor plan.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages and also to avoid the appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.